

Space product assurance

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NOTE: This draft shows the impact of ECSS-Q-ST-60C Rev.4 DIR1 also distributed for Public Review.

(Duration: 8 weeks)

Start Public Review: 6 November 2024

**End Public Review: 17 January 2025**

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ECSS Secretariat

ESA-ESTEC

Requirements & Standards Section

Noordwijk, The Netherlands

**Foreword**

ECSS is a cooperative effort of the European Space Agency, national space agencies and European industry associations for the purpose of developing and maintaining common standards. Requirements in this Standard are defined in terms of what shall be accomplished, rather than in terms of how to organize and perform the necessary work. This allows existing organizational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

This Standard has been prepared by the Working Group, under the auspice of the ESCC Space Components Steering Board, reviewed by the ECSS Executive Secretariat and jointly approved by the ESCC SCSB and the ECSS Technical Authority.

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Change log

|  |  |
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|  | Change log for Draft development |
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| ECSS-Q-ST-60-13C Rev.2 DFR1  29 October 2024 | Public Review 6 November 2024 – 17 January 2025 |
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| DIR + impl. DRRs | DRR Feedback |
| DIA | TA Vote for publication |
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Introduction

This standard is based on and complementary to ECSS-Q-ST-60C. It defines the applicability and tailoring of the requirements of ECSS-Q-ST-60C for COTS EEE. This standard can only be used in conjunction with ECSS-Q-ST-60C in its current revision. This standard applies only to commercial components - as defined in its scope - which meet defined technical parameters that are on the system application level demonstrated to be unachievable with existing space components or only achievable with qualitative and quantitative penalties. The standard requires that qualitative and quantitative penalties are specified, as applicable, as a minimum in terms of quantifiable parameters such as: functional capability, parts count, power dissipation, frequency of operation, data/signal processing efficiency, interconnect complexity, mass, volume, …

For traceability to ECSS-Q-ST-60, the modifications or additions are marked in blue. Text in black colour is unmodified text.

For easy tailoring and implementation of the requirements into a Requirement Management Tool, and for direct traceability to ECSS-Q-ST-60, requirements in this standards have been written in the way of a ECSS Applicability Requirement Matrix (EARM), as defined in Annex A of ECSS-S-ST-00 “ECSS system – Description, implementation and general requirements”.

In line with ECSS-Q-ST-60, this standard differentiates between three classes of components through three different sets of standardization requirements (clauses) to be met.

The three classes provide for three levels of trade-off between assurance and risk. The highest assurance and lowest risk is provided by class 1 and the lowest assurance and highest risk by class 3. Procurement costs are typically highest for class 1 and lowest for class 3. Mitigation and other engineering measures can decrease the total cost of ownership differences between the three classes. The project objectives, definition and constraints determine which class or classes of components are appropriate to be utilised within the system and subsystems.

1. Class 1 components are described in Clause 4
2. Class 2 components are described in Clause 5
3. Class 3 components are described in Clause 6

The objective of the EEE component selection, control, procurement and use requirements is to ensure that EEE components used in a space project enables the project to meet its mission requirements.

Important elements of EEE component requirements include:

1. component programme management,
2. component selection, evaluation and approval,
3. procurement,
4. handling and storage,
5. component quality assurance,
6. specific components, and
7. documentation.

The main tools which can be used to reach the objective are:

1. concurrent engineering,
2. standardization of component types,
3. characterization of components,
4. assessment of component manufacturers including declared competencies and processes,
5. testing, screening, lot acceptance and periodic testing,
6. procurement specifications,
7. control and inspection,
8. control of nonconforming materials,
9. assessment and use of existing component data,
10. application of specific control to mitigate risk for components with limited data or confidence, and
11. information management.

The basic approach is as follows:

* The customer of a given space project defines the EEE component requirements within the boundaries of this standard. They appear in the appropriate clauses of the project requirements as defined in ECSS-M-ST-10.
* The supplier defines a component control plan to implement those requirements into a system which enables, for instance, to control the selection, approval, procurement, handling in a schedule compatible with his requirements, and in a cost-efficient way.
* The supplier ensures that the applicable parts requirements are passed down to lower level suppliers and ensure that they are compliant to these parts requirements.

# Scope

This standard defines the requirements for selection, control, procurement and usage of EEE commercial components for space projects.

This standard is applicable to commercial parts from the following families:

* Ceramic capacitors chips
* Solid electrolyte tantalum capacitors chips
* Discrete parts (transistors, diodes, optocouplers)
* Fuses
* Magnetic parts
* Microcircuits
* Resistors chips
* Thermistors

In addition for families of EEE components not addressed by the present ECSS standard, it can be used as guideline on case by case basis.

The requirements of this document are applicable to all parties involved at all levels in the integration of EEE commercial components into space segment hardware and launchers.

This standard may be tailored for the specific characteristics and constrains of a space project in conformance with ECSS-S-ST-00.

# Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

|  |  |
| --- | --- |
| ECSS-S-ST-00-01 | ECSS system - Glossary of terms |
| ECSS-Q-ST-60 | Space product assurance - Electrical, electronic and electromechanical (EEE) components |
| ECSS-Q-ST-60-14 | Space product assurance - Relifing procedure - EEE components |
| ECSS-Q-ST-60-15 | Space product assurance – Radiation hardness assurance – EEE components |
| ESCC 21300 | Terms, definitions, abbreviations, symbols and units |
| ESCC 24900 | Minimum requirements for controlling environmental contamination of components |
| ESCC 25500 | Methodology for the detection of pure tin in the external surface finish of case and leads of EEE components |
| MIL-STD-750 | Test methods for semiconductor devices |
| MIL-STD-883 | Test method standard microcircuits |
| JESD22-A101 | Steady state temperature humidity bias life test |
| JESD22-A110 | Highly accelerated temperature and humidity stress test |
| JESD22-A113 | Preconditioning of plastic surface mount devices prior to reliability testing |
| JESD22-A121 | Test Method for Measuring Whisker Growth on Tin and Tin Alloy Surface Finishes |
| JESD22-B106 | Resistance to soldering temperature for through hole mounted devices |
| JESD-201 | Environmental Acceptance Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finishes |
| J-STD-020 | Moisture/Reflow sensitivity classification for nonhermetic solid state surface mount devices |
| J-STD-033 | Handling, packing, shipping and use of moisture/ reflow sensitive surface mount devices |
| GEIA-STD-005-2 | Standard for mitigating the effects of tin whiskers in aerospace and high performance electronic systems. |
| ESCC 21004 | Guidelines for incoming inspection of EEE components (ESCC basic specification no. 21004) |
| ESCC22500 | Guidelines for displacement damage irradiation testing |
| ESCC20600 | Preservation packaging and despatch of SCC components |
| AEC-Q100 | Failure mechanism based stress test qualification for integrated circuits |
| AEC\_Q101 | Stress test qualification for automotive grade discrete semiconductors |
| AEC-Q200 | Stress test qualification for passive components |

# Terms, definitions and abbreviated terms

## Terms from other standards

1. For the purpose of this standard, the terms and definitions from ECSS-S-ST-00-01 apply.
2. For the purpose of this standard, the following terms and definitions from ECSS-Q-ST-60 apply:
   1. agent
   2. characterization
   3. commercial component
   4. concurrent engineering
   5. franchised distributor
   6. parts engineer
   7. parts procurer
   8. qualified parts
   9. screening
   10. space qualified parts

## Terms specific to the present standard

1. traceability information (trace code)

unique identifier used by manufacturers to label and trace a quantity of components with at least a common assembly history

1. 1 The notion of “lot of EEE parts” used for lot acceptance tests, except for radiation, is defined by the same trace code.
2. 2 The notion of "lot of EEE parts" used for the radiation is defined by the same diffusion lot.
3. 3 Several trace codes can be part of a same delivery from the manufacturer or the distributor.
4. 4 It is possible to have several diffusion lots and wafer fabs (as per ESCC 21300) in the same trace code.

## Abbreviated terms

For the purpose of this Standard, the abbreviated terms from ECSS-S-ST-00-01 and the following apply:

| Abbreviation | Meaning |
| --- | --- |
| **AOQ** | average outgoing quality |
| **ASIC** | application specific integrated circuit |
| **BGA** | ball grid array |
| **CA** | construction analysis |
| **CCD** | charge coupled device |
| **CCP** | component control plan |
| **CN** | change notice |
| **CoC** | certificate of conformance |
| **CDR** | critical design review |
| **CR** | change request |
| **DCL** | declared components list |
| **DPA** | destructive physical analysis |
| **DRD** | document requirement definition |
| **DSM** | deep Sub-Micron |
| **Ea** | activation energy |
| **ECSS** | European Coordination for Space Standardization |
| **EEE** | electrical, electronic, electromechanical |
| **EFR** | early failure rate |
| **ESCC** | European space components coordination |
| **GSE** | ground support equipment |
| **HAST** | highly accelerated stress test |
| **HTRB** | high temperature reverse bias |
| **JD** | justification document |
| **LAT** | lot acceptance test |
| **LED** | light emitting diode |
| **LVT** | lot validation testing |
| **MMIC** | microwave monolithic integrated circuit |
| **PAD** | parts approval document |
| **PCB** | parts control board |
| **PCN** | process change notice |
| **PDA** | percent defective allowable |
| **PED** | plastic encapsulated device |
| **PIND** | particle impact noise detection |
| **QBSD** | full quadrant back scatter electron detector |
| **QCI** | quality conformance inspection |
| **RFD** | request for deviation |
| **RH** | relative humidity |
| **RoHs** | restriction of the use of certain hazardous substances |
| **RVT** | radiation verification testing |
| **SCSB** | Space Components Steering Board |
| **SAM** | scanning accoustic microscopy |
| **SEM** | scanning electron microscope |
| **SMD** | surface mount device |
| **TCI** | technology conformance inspection |
| **Tg** | Glass Transition Temperature |
| **THB** | temperature humidity bias |
| **Tj** | junction temperature |
| **T/C** | thermal cycling |
| **TM** | Test Method |

## Conventions

1. The term “EEE component“ is synonymous with the terms "EEE Part", "Component" or just "Part".
2. The term “for approval” means that a decision of the approval authority is necessary for continuing the process.
3. The term “for review” means that raised reviewers comments are considered and dispositioned.
4. The term “for information” means that no comments are expected about the delivered item.
5. For the purpose of clear understanding of this document, hereunder is a listing of component categories which are covered by the term EEE component, encapsulated or non-encapsulated, irrespective of the quality level:
   1. Cable assemblies (high date Rate & RF, optical Fibre)
   2. Capacitors
   3. Connectors
   4. Crystals
   5. Discrete semiconductors (including diodes, transistors, microvwave)
   6. Filters
   7. Fuses
   8. Magnetic components (e.g. inductors, transformers, including in-house products)
   9. Monolithic Microcircuits (including MMICs)
   10. Oscillators
   11. Hybrid circuits
   12. Relays
   13. Resistors, heaters
   14. Surface acoustic wave devices
   15. Switches (including mechanical, thermal)
   16. Thermistors
   17. Wires and Cables
   18. Optoelectronic Devices (including opto‑couplers, LED, CCDs, displays, sensors)
   19. Passive Microwave Devices (including, for instance, mixers, couplers, isolators and switches)
   20. Microwave switches consisting of multiple EEE components are considered as equipment. The requirements of this standard are applicable to the EEE parts they incorporate and to microwave switches having a simple design (single EEE part).

## Nomenclature

The following nomenclature applies throughout this document:

1. The word “shall” is used in this Standard to express requirements. All the requirements are expressed with the word “shall”.
2. The word “should” is used in this Standard to express recommendations. All the recommendations are expressed with the word “should”.
   1. It is expected that, during tailoring, recommendations in this document are either converted into requirements or tailored out.
3. The words “may” and “need not” are used in this Standard to express positive and negative permissions, respectively. All the positive permissions are expressed with the word “may”. All the negative permissions are expressed with the words “need not”.
4. The word “can” is used in this Standard to express capabilities or possibilities, and therefore, if not accompanied by one of the previous words, it implies descriptive text.
   1. In ECSS “may” and “can” have completely different meanings: “may” is normative (permission), and “can” is descriptive.
5. The present and past tenses are used in this Standard to express statements of fact, and therefore they imply descriptive text.

## Convention for the Applicability Matrix

The following terminology applies for the column “Applicability” of the applicability matrix:

|  |  |
| --- | --- |
| **Applicability** | **Explanation** |
| Applicable | Requirement of ECSS-Q-ST-60 applies |
| Not applicable | Requirement from ECSS-Q-ST-60 does not apply |
| Modified | Requirement of ECSS-Q-ST-60 applies with modified text |
| New | Requirement added in ECSS-Q-ST-60-13 and not present in ECSS-Q-ST-60 |
| Deleted | Requirement is deleted in the applicable version of ECSS-Q-ST-60 or ECSS-Q-ST-60-13  NOTE: In case of the deletion of a requirement that existed only in ECSS-Q-ST-60-13 the former text is replaced by the word <<deleted>> |

# Requirements for class 1 components

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Requirement | Applicability | |
| **4.1 Component programme management** | | | |
| **4.1.1 General** | | | |
| 4.1.1a |  | | Deleted |
| **4.1.2 Components control programme** | | | |
| **4.1.2.1 Organization** | | | |
| 4.1.2.1a |  | Applicable | |
| 4.1.2.1b |  | Deleted | |
| **4.1.2.2 Component control plan** | | | |
| 4.1.2.2a |  | Applicable | |
| 4.1.2.2b |  | Applicable | |
| 4.1.2.2c |  | Applicable | |
| **4.1.3 Parts control board** | | | |
| 4.1.3a |  | Applicable | |
| 4.1.3b |  | Applicable | |
| 4.1.3c |  | Applicable | |
| 4.1.3d |  | Applicable | |
| **4.1.4 Declared component list** | | | |
| 4.1.4a |  | Applicable | |
| 4.1.4b |  | Applicable | |
| 4.1.4c |  | Applicable | |
| 4.1.4d |  | Applicable | |
| 4.1.4e |  | Applicable | |
| 4.1.4f |  | Applicable | |
| 4.1.4g |  | Applicable | |
| 4.1.4h |  | Applicable | |
| 4.1.4i |  | Applicable | |
| **4.1.5 Electrical and mechanical GSE** | | | |
| 4.1.5a |  | Applicable | |
| 4.1.5b |  | Applicable | |
| **4.1.6 EQM components** | | | |
| 4.1.6a |  | Applicable | |
| 4.1.6b |  | Applicable | |
| **4.2 Component selection, evaluation and approval** | | | |
| **4.2.1 General** | | | |
| 4.2.1a |  | Applicable | |
| 4.2.1b |  | Applicable | |
| **4.2.2 Manufacturer and component selection** | | | |
| **4.2.2.1 General rules** | | | |
| 4.2.2.1a |  | Applicable | |
| 4.2.2.1b |  | Applicable | |
| 4.2.2.1c | <<deleted and moved to 4.2.2.3d>> | Deleted | |
| 4.2.2.1d | <<deleted, modified and moved to 4.2.2.3e>> | Deleted | |
| 4.2.2.1e | <<deleted and moved to 4.2.2.3f>> | Deleted | |
| 4.2.2.1f | <<deleted and moved to 4.2.2.3g>> | Deleted | |
| 4.2.2.1g | For the assessment of commercial components, the supplier shall collect the available data on the manufacturer and the component in the JD specified in the requirement 4.2.4d.   1. It is important to check the exhaustiveness of the manufacturer documentation & data sheet with respect to e.g. the following items:  * component marking, * mechanical description, * electrical and thermal description. | New | |
| 4.2.2.1h | <<deleted>> | Deleted | |
| **4.2.2.2 Parts and material restriction** | | | |
| 4.2.2.2a |  | Applicable | |
| 4.2.2.2b |  | Applicable | |
| 4.2.2.2c |  | Applicable | |
| 4.2.2.2d |  | Applicable | |
| 4.2.2.2e |  | Applicable | |
| 4.2.2.2f |  | Applicable | |
| 4.2.2.2g |  | Applicable | |
| 4.2.2.2h |  | Applicable | |
| 4.2.2.2i |  | Applicable | |
| 4.2.2.2.j |  | Applicable | |
| 4.2.2.2k |  | Applicable | |
| 4.2.2.2l |  | Applicable | |
| **4.2.2.3 Preferred sources** | | | |
| 4.2.2.3a |  | Not applicable | |
| 4.2.2.3b |  | Not applicable | |
| 4.2.2.3c |  | Applicable | |
| 4.2.2.3d |  | Not applicable | |
| 4.2.2.3e |  | Applicable | |
| 4.2.2.3f |  | Applicable | |
| 4.2.2.3g |  | Applicable | |
| **4.2.2.4 Radiation hardness** | | | |
| 4.2.2.4a |  | Applicable | |
| 4.2.2.4b |  | Applicable | |
| 4.2.2.4c |  | Applicable | |
| 4.2.2.4d |  | Applicable | |
| 4.2.2.4e |  | Applicable | |
| 4.2.2.4f |  | Applicable | |
| 4.2.2.4g |  | Applicable | |
| 4.2.2.4h |  | Applicable | |
| 4.2.2.4i |  | Applicable | |
| **4.2.2.5 Derating** | | | |
| 4.2.2.5a |  | Applicable | |
| 4.2.2.5b |  | Deleted | |
| **4.2.2.6 Temperature range** | | | |
| 4.2.2.6a | Commercial parts shall be selected in the highest available temperature range. | New | |
| 4.2.2.6b | A minimum 10 °C margin shall be used between the maximum manufacturer temperature range and the application temperature range (including worst cases). | New | |
| 4.2.2.6c | <<deleted>> | Deleted ~~New~~ | |
| 4.2.2.6d | Operating temperature range of all commercial parts shall be greater or equal to (-40 / 85) °C. | New | |
| 4.2.2.6e | Temperature range of commercial ceramic capacitors shall be greater or equal to (-40 / 125) °C | New | |
| **4.2.3 Component evaluation** | | | |
| **4.2.3.1 General** | | | |
| 4.2.3.1a |  | Applicable | |
| 4.2.3.1b |  | Deleted | |
| 4.2.3.1c |  | Applicable | |
| 4.2.3.1d |  | Applicable | |
| 4.2.3.1e |  | Applicable | |
| 4.2.3.1f |  | Applicable | |
| 4.2.3.1g |  | Applicable | |
| 4.2.3.1h |  | Applicable | |
| 4.2.3.1i | The supplier shall review the evaluation results to determine their impact on the content of the screening and lot acceptance tests. | Modified | |
| 4.2.3.1j |  | Applicable | |
| 4.2.3.1k | The supplier shall prepare a preliminary internal supplier’s specification for electrical testing during evaluation tests.   1. This specification can be part of the Justification document. | New | |
| 4.2.3.1l | The supplier specification specified in 4.2.3.1k shall as minimum include tested parameters, test conditions, acceptance criteria, drift limits. | New | |
| 4.2.3.1m | The supplier shall update the internal supplier’s specification used for screening and lot acceptance in accordance with the results of evaluation testing. | New | |
| 4.2.3.1n | The preliminary and the final internal supplier’s specification as specified in Annex C shall be submitted to the customer for approval. | New | |
| **4.2.3.2 Component manufacturer assessment** | | | |
| 4.2.3.2.1 |  | Not applicable  See 4.2.2.1.g | |
| 4.2.3.2.2a |  | Not applicable  See 4.2.2.1.g | |
| 4.2.3.2.2b |  | Not applicable  See 4.2.2.1.g | |
| **4.2.3.3. Construction analysis** | | | |
| 4.2.3.3a |  | Applicable | |
| 4.2.3.3b | The Construction analysis shall be documented by a procedure to be submitted on request to the customer for information.   1. Annex H provides guidelines for microcircuits, diodes, transistors and optocouplers. | Modified | |
| 4.2.3.3c |  | Applicable | |
| **4.2.3.4 Evaluation testing** | | | |
| 4.2.3.4a |  | Applicable | |
| 4.2.3.4b |  | Applicable | |
| 4.2.3.4c | Evaluation tests shall be performed as specified in:  1. Table 8–1 for ceramic capacitors chips  2. Table 8–2 for solid electrolyte tantalum capacitors chips  3. Table 8–3 for discrete parts (diodes, transistors, optocouplers)  4 Table 8–4 for fuses  5. Table 8–5 for magnetic parts  6. Table 8–6 for microcircuits  7. Table 8–7 for resistors  8. Table 8–8 for thermistors | New | |
| 4.2.3.4d | Omission of any of the elements of tests specified in Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7 and Table 8–8, or the introduction of alternative activities, shall be justified in the JD. | New | |
| 4.2.3.4e | <<deleted>> | Deleted | |

Figure 4‑1: <<deleted>>

Table 4–1: <<deleted and moved as legacy test files as Table 8–9>>

|  |  |  |  |
| --- | --- | --- | --- |
| **4.2.4 Parts approval** | | | |
| 4.2.4a |  | | Deleted |
| 4.2.4b |  | | Deleted |
| 4.2.4c |  | | Applicable |
| 4.2.4d | The approval process by the customer depends on the part qualification status and shall be organized as follows: | | Modified |
|  |  | | Not applicable |
|  |  | | Not applicable |
|  |  | | Applicable |
|  | <<deleted>> | | Deleted |
| 4.2.4e | In case the evaluation results are changing the testing conditions documented in the JD, a new revision of JD shall be submitted to the customer for approval. | | Modified |
| 4.2.4f |  | | Applicable |
| 4.2.4g | The previous use or approval of a part via JD in any other project shall not be included as an automatic approval for the present program. | | Modified |
| 4.2.4h | All programmable devices shall be subject to JD approval. | | Modified |
| 4.2.4i | Hybrids, ASICs and MMICs shall be covered by JD even if included in Capability Approval List, QML, QPL. | | Modified |
| 4.2.4j | For ASICs built on space qualified technologies, the JD may be replaced, if agreed with the customer, by information embedded in the DCL. | | Modified |
| **4.3 Component procurement** | | | |
| **4.3.1 General** | | | |
| 4.3.1a | |  | Applicable |
| 4.3.1b | |  | Not applicable |
| 4.3.1c | |  | Not applicable |
| 4.3.1d | |  | Applicable |
| 4.3.1e | |  | Applicable |
| 4.3.1f | |  | Applicable |
| 4.3.1g | |  | Applicable |
| 4.3.1h | |  | Applicable |
| 4.3.1i | |  | Applicable |
| 4.3.1j | | Each procured EEE part shall be traceable to a manufacturer assigned trace code.   1. 1 The procurement of a single trace code per delivery lot should be preferred and encouraged. 2. 2 Some passive components can be traceable with datecode only. | New |
| 4.3.1j | | Each trace code shall be maintained as is through the entire supply chain including distributor.   1. As far as possible, commercial parts should be ordered in the manufacturer’s standard packing quantities or multiples thereof to avoid distributor re-packing and handling and to preserve the traceability information usually included on the original manufacturer packaging. | New |
| 4.3.1k | | The supplier shall ensure that the elements of the JD in accordance with Annex F, including any action plan, are applicable to flight parts. | New |
| **4.3.2 Procurement specification** | | | |
| 4.3.2a | The supplier shall procure EEE components according to controlled specifications.   1. It can be procurer’s in-house specification, a manufacturer’s drawing or a datasheet as a minimum. | | Modified |
| 4.3.2b |  | | Not applicable |
| 4.3.2c |  | | Not applicable |
| 4.3.2d |  | | Not applicable |
| 4.3.2e |  | | Applicable |
| 4.3.2f |  | | Applicable |
| 4.3.2g |  | | Applicable |
| 4.3.2h | If additional requirements to the manufacturer are identified by the supplier, they shall be specified in the procurement specification, in conformance with DRD from Annex C. | | New |
| **4.3.3. Screening requirements** | | | |
| 4.3.3a |  | | Applicable |
| 4.3.3b |  | | Applicable |
| 4.3.3c |  | | Applicable |
| 4.3.3d | For commercial parts, screening tests shall be performed in accordance with:  Table 8–1 for ceramic capacitors chips,  Table 8–2 for solid electrolyte tantalum capacitors chips  Table 8–3 for discrete parts (diodes, transistors, optocouplers)  Table 8–4 for fuses  Table 8–5 for magnetic parts  Table 8–6 for microcircuits  Table 8–7 for resistors  Table 8–8 for thermistors | | Modified |
| 4.3.3e |  | | Deleted |
| 4.3.3f |  | | Applicable |
| 4.3.3g |  | | Deleted |
| 4.3.3h |  | | Applicable |

Table 4–2: <<deleted and moved as legacy test files as Table 8–10>>

|  |  |  |
| --- | --- | --- |
| **4.3.4 Initial customer source inspection (precap)** | | |
| 4.3.4a |  | Not applicable |
| 4.3.4b |  | Not applicable |
| 4.3.4c |  | Not applicable |
| **4.3.5 Lot acceptance** | | |
| 4.3.5a | The supplier shall ensure that any lot/date code of EEE parts is submitted to a lot acceptance procedure, in line with applied normative systems, according to the following rules: | Modified |
| 1. | Not applicable |
| 2. | Not applicable |
| 3. | Applicable |
| 4.3.5b |  | Not applicable |
| 4.3.5c | Lot acceptance tests shall be performed as specified in:  Table 8–1 for ceramic capacitors chips  Table 8–2 for solid electrolyte tantalum capacitors chips  Table 8–3 for discrete parts (diodes, transistors, optocouplers)  Table 8–4 for fuses  Table 8–5 for magnetic parts  Table 8–6 for microcircuits  Table 8–7 for resistors  Table 8–8 for thermistors | New |

Figure 4‑2: <<deleted>>

Table 4–3: <<deleted and moved as legacy test files as Table 8–11>>

|  |  |  |
| --- | --- | --- |
| **4.3.6 Final customer source inspection (buy-off)** | | |
| 4.3.6a |  | Not applicable |
| 4.3.6b |  | Not applicable |
| 4.3.6c | For commercial parts, the buy off shall be replaced by an incoming inspection at the procurement entity’s facility reported in the JD in accordance with clause 4.3.7. | Modified |
| 4.3.6d |  | Not applicable |
| **4.3.7 Incoming inspection** | | |
| 4.3.7a |  | Applicable |
| 4.3.7b |  | Applicable |
| 4.3.7c |  | Applicable |
| 4.3.7d |  | Not applicable |
| 4.3.7e |  | Applicable |
| **4.3.8 Radiation verification testing** | | |
| 4.3.8a |  | Applicable |
| 4.3.8b |  | Applicable |
| 4.3.8c |  | Not applicable |
| 4.3.8d |  | Applicable |
| 4.3.8e |  | Applicable |
| 4.3.8f | Parts submitted to total dose test shall be first screened as specified in the clause 4.3.3 to be fully representative of flight parts. | New |
| **4.3.9 Destructive physical analysis** | | |
| 4.3.9a | The DPA shall be performed according to the procurement Tables Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7, Table 8–8 of Clause 8. | Modified |
| 4.3.9b |  | Not applicable |
| 4.3.9c |  | Not applicable |
| 4.3.9d |  | Not applicable |
| 4.3.9e | The DPA process shall be documented by a procedure to be submitted, on request, to the customer for information.   1. For guidance refer to the basic specification ESSC 20600 and for active parts ECSS-Q-ST-60-13 Annex H. | Modified |
| 4.3.9f |  | Applicable |
| 4.3.9g |  | Deleted |
| 4.3.9h |  | Not applicable |
| 4.3.9i |  | Applicable |
| 4.3.9j |  | Applicable |
| 4.3.9k | <<deleted>> | Deleted |
| **4.3.10 Relifing** | | |
| 4.3.10a |  | Applicable |
| 4.3.10b |  | Applicable |
| 4.3.10c | <<deleted>> | Deleted |
| 4.3.10d | <<deleted>> | Deleted |
| **4.3.11 Manufacturer’s data documentation deliveries** | | |
| 4.3.11a | The manufacturer’s or the franchised distributor’s CoC shall be delivered to the parts procurer. | Modified |
| 4.3.11b | Any other data, defined in the procurement documents, shall be delivered to the parts’ procurer in line with the purchase order. | Modified |
| 4.3.11c |  | Applicable |
| **4.4 Handling and storage** | | |
| 4.4a | The supplier shall establish and implement procedures for handling and storage of components in order to prevent possible degradation.   1. For guidance, refer to the basic specification ESCC 20600. | Applicable |
| 4.4b |  | Applicable |
| 4.4c |  | Applicable |
| 4.4d |  | Applicable |
| 4.4e |  | Applicable |
| 4.4f |  | Applicable |
| 4.4g |  | Applicable |
| 4.4h |  | Applicable |
| 4.4i | Plastic encapsulated devices shall be stored in one of the following conditions:  1. Dry Nitrogen  2. Dry and ionised air, with RH in a range of 15% to 20%  3. Dry packs as specified in J-STD-033 for dry pack inspection and control | New |
| **4.5 Components quality assurance** | | |
| **4.5.1 General** | | |
| 4.5.1a |  | Applicable |
| **4.5.2 Nonconformances or failures** | | |
| 4.5.2a |  | Applicable |
| 4.5.2b |  | Applicable |
| 4.5.2c |  | Applicable |
| 4.5.2d |  | Applicable |
| **4.5.3 Alerts** | | |
| 4.5.3a |  | Applicable |
| 4.5.3b |  | Applicable |
| 4.5.3c |  | Applicable |
| **4.5.4 Traceability** | | |
| 4.5.4a |  | Deleted |
| 4.5.4b |  | Applicable |
| 4.5.4c |  | Applicable |
| 4.5.4d | The traceability of EEE parts during installation in equipment, shall be ensured by the supplier through maintaining the traceability to the manufacturer’s trace code number of the EEE parts actually mounted. | Modified |
| 4.5.4e | If the as built DCL has not yet been delivered, the supplier shall be able to provide this information (part type actually installed with its relevant trace code number) within one week. | Modified |
| **4.5.5 Lot homogeneity for sampling test** | | |
| 4.5.5a | If tests are performed by sampling, the sampled parts shall be selected so that they are representative of the trace code distribution. | Modified |
| 4.5.5b |  | Applicable |
| **4.6 Specific components** | | |
| **4.6.1 General** | | |
| 4.6.1a | <<deleted>> | Deleted |
| **4.6.2 ASICs** | | |
| 4.6.2a |  | Applicable |
| **4.6.3 Hybrids** | | |
| 4.6.3a |  | Not applicable |
| 4.6.3b |  | Not applicable |
| 4.6.3c |  | Not applicable |
| **4.6.4 One time programmable and reprogrammable devices** | | |
| 4.6.4a |  | Applicable |
| 4.6.4b | <<deleted>> | Deleted |
| 4.6.4c | <<deleted>> | Deleted |
| 4.6.4d |  | Applicable |
| 4.6.4e |  | Applicable |
| 4.6.4f |  | Applicable |
| 4.6.4g |  | Deleted |
| 4.6.4h |  | Deleted |
| **4.6.5 Microwave monolithic integrated circuits** | | |
| 4.6.5a |  | Not applicable |
| **4.6.6 Connectors** | | |
| 4.6.6a |  | Not applicable |
| **4.6.7 High Voltage Application** | | |
| 4.6.7a |  | Applicable |
| **4.6.8 Self Made Magnetics** | | |
| 4.6.8a |  | Applicable |
| 4.6.8b |  | Applicable |
| **4.7 Documentation** | | |
| 4.7a | Any result from inspection or control shall be documented (including lot acceptance, incoming, relifing and complementary tests). | Modified |

Table 4-4: Documentation for Class 1 components

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Clause** | **Customer** | **Comments** |
| New ***:*** Procedure for hot solder dip process | 4.2.2.2j. | Approval | For retinning operation |
| New ***:*** Internal supplier’s specification | 4.2.3.1k. | Approval | Applicable to the preliminary and final internal supplier’s specification |
| ***PAD : not applicable*** | 4.2.4 | - | - |
| New ***:*** Justification Document | 4.2.4 | Approval | - |
| ***Procedure for customer precap : not applicable*** | 4.3.4 | - | - |
| New ***:*** Procedure for construction analysis | 4.2.3.3 | Information (on request) | - |
| New ***:***Evaluation and LAT report | 4.2.4d. | Information  (on request) | - |

# Requirements for class 2 components

|  |  |  |
| --- | --- | --- |
| **5.1 Components programme management** | | |
| **5.1.1. General** | | |
| 5.1.1a |  | Deleted |
| **5.1.2 Components control programme** | | |
| **5.1.2.1 Organization** | | |
| 5.1.2.1a |  | Applicable |
| **5.1.2.2 Component control plan** | | |
| 5.1.2.2a |  | Applicable |
| 5.1.2.2b |  | Applicable |
| **5.1.3 Parts control board** | | |
| 5.1.3a |  | Applicable |
| 5.1.3b |  | Applicable |
| 5.1.3c |  | Applicable |
| 5.1.3d |  | Applicable |
| **5.1.4. Declared component list** | | |
| 5.1.4a |  | Applicable |
| 5.1.4b |  | Applicable |
| 5.1.4c |  | Applicable |
| 5.1.4d |  | Applicable |
| 5.1.4e |  | Applicable |
| 5.1.4f |  | Applicable |
| 5.1.4g |  | Applicable |
| 5.1.4h |  | Applicable |
| 5.1.4i |  | Applicable |
| **5.1.5. Electrical and mechanical GSE** | | |
| 5.1.5a |  | Applicable |
| 5.1.5b |  | Applicable |
| **5.1.6 EQM components** | | |
| 5.1.6a |  | Applicable |
| 5.1.6b |  | Applicable |
| **5.2 Component selection, evaluation and approval** | | |
| **5.2.1 General** | | |
| 5.2.1a |  | Applicable |
| 5.2.1b |  | Applicable |
| **5.2.2. Manufacturer and component selection** | | |
| **5.2.2.1 General rules** | | |
| 5.2.2.1a |  | Applicable |
| 5.2.2.1b |  | Applicable |
| 5.2.2.1c | <<deleted and moved to 5.2.2.5a>> | Deleted |
| 5.2.2.1d | <<deleted and moved to 5.2.2.5b>> | Deleted |
| 5.2.2.1e | For the assessment of commercial components, the supplier shall collect the available data on the manufacturer and the component in the JD. Specified in the requirement 5.2.4.d.   1. It is important to check the exhaustiveness of the manufacturer documentation & data sheet with respect to the following items:  * component marking, * mechanical description, * electrical and thermal description | New |
| 5.2.2.1f | <<deleted>> | Deleted |
| **5.2.2.2. Parts and material restriction** | | |
| 5.2.2.2a |  | Applicable |
| 5.2.2.2b |  | Applicable |
| 5.2.2.2c |  | Applicable |
| 5.2.2.2d |  | Applicable |
| 5.2.2.2e |  | Applicable |
| 5.2.2.2f |  | Applicable |
| 5.2.2.2g |  | Applicable |
| 5.2.2.2h |  | Applicable |
| 5.2.2.2i |  | Applicable |
| 5.2.2.2.j |  | Applicable |
| 5.2.2.2k |  | Applicable |
| 5.2.2.2l |  | Applicable |
| **5.2.2.3 Preferred sources** | | |
| 5.2.2.3a | Preference shall be given to components which necessitate the least evaluation or qualification effort. | Modified |
| 5.2.2.3b |  | Applicable |
| 5.2.2.3c |  | Applicable |
| **5.2.2.4 Radiation hardness** | | |
| 5.2.2.4a |  | Applicable |
| 5.2.2.4b |  | Applicable |
| 5.2.2.4c |  | Applicable |
| 5.2.2.4d |  | Applicable |
| 5.2.2.4e |  | Applicable |
| 5.2.2.4f |  | Applicable |
| 5.2.2.4g |  | Applicable |
| 5.2.2.4h |  | Applicable |
| 5.2.2.4i |  | Applicable |
| **5.2.2.5 Derating** | | |
| 5.2.2.5a |  | Applicable |
| 5.2.2.5b |  | Deleted |
| **5.2.2.6 Temperature range** | | |
| 5.2.2.6a | Commercial parts shall be selected in the highest available temperature range. | New |
| 5.2.2.6b | A minimum 10°C margin shall be used between the maximum manufacturer temperature range and the application temperature range (including worst cases). | New |
| 5.2.2.6c | <<deleted>> | Deleted |
| 5.2.2.6d | Operating temperature range of all commercial parts shall be greater or equal to (-40 / 85) °C. | New |
| 5.2.2.6e | Temperature range of commercial ceramic capacitors shall be greater or equal to (-40 / 125) °C. | New |
| **5.2.3 Component evaluation** | | |
| **5.2.3.1 General** | | |
| 5.2.3.1a |  | Applicable |
| 5.2.3.1b |  | Deleted |
| 5.2.3.1c |  | Applicable |
| 5.2.3.1d |  | Applicable |
| 5.2.3.1e |  | Applicable |
| 5.2.3.1f |  | Applicable |
| 5.2.3.1g |  | Applicable |
| 5.2.3.1h |  | Applicable |
| 5.2.3.1i | The supplier shall review the evaluation results to determine their impact on the content of the screening and lot acceptance tests. | Modified |
| 5.2.3.1j |  | Applicable |
| 5.2.3.1k | The supplier shall prepare a preliminary internal supplier’s specification for electrical testing during evaluation tests.   1. This specification can be part of the Justification document. | New |
| 5.2.3.1l | The supplier specification specified in 5.2.3.1k shall as minimum include test parameters, test conditions, acceptance criteria, drift limits. | New |
| 5.2.3.1m | The supplier shall update the internal supplier’s specification used for screening and lot acceptance in accordance with the results of evaluation testing. | New |
| 5.2.3.1n | The preliminary and the final internal supplier’s specification as specified in Annex C shall be submitted to the customer for approval. | New |
| **5.2.3.2 Component manufacturer assessment** | | |
| 5.2.3.2a |  | Not applicable  See 5.2.2.1.e. |
| **5.2.3.3 Construction analysis** | | |
| 5.2.3.3a |  | Applicable |
| 5.2.3.3b | The Construction analysis shall be documented by a procedure to be submitted on request to the customer for information.   1. Annex H provides guidelines for microcircuits, diodes, transistors and optocouplers. | Modified |
| 5.2.3.3c |  | Applicable |
| **5.2.3.4. Evaluation testing** | | |
| 5.2.3.4a |  | Applicable |
| 5.2.3.4b |  | Applicable |
| 5.2.3.4c | Evaluation tests shall be performed as specified in:  1. Table 8–1 for ceramic capacitors chips  2. Table 8–2 for solid electrolyte tantalum capacitors chips  3. Table 8–3 for discrete parts (diodes, transistors, optocouplers)  4 Table 8–4 for fuses  5. Table 8–5 for magnetic parts  6. Table 8–6 for microcircuits  7. Table 8–7 for resistors  8. Table 8–8 for thermistors | New |
| 5.2.3.4d | Omission of any of the elements of tests specified in Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7 and Table 8–8, or the introduction of alternative activities, shall be justified in the JD. | New |
| 5.2.3.4e | <<deleted>> | Deleted |

Figure 5‑1: <<deleted>>

Table 5–1: <<deleted and moved as Legacy test files as Table 8–12>>

|  |  |  |
| --- | --- | --- |
| **5.2.4 Parts approval** | | |
| 5.2.4a |  | Deleted |
| 5.2.4b |  | Deleted |
| 5.2.4c |  | Applicable |
| 5.2.4d | The approval process by the customer depends on the part qualification status and shall be organized as follows: | Modified |
|  | Not applicable |
|  | Not applicable |
|  | Applicable |
| <<deleted>> | Deleted |
| 5.2.4e | In case the evaluation results are changing the testing conditions documented in the JD, a new revision of JD shall be submitted to the customer for approval. | Modified |
| 5.2.4f |  | Applicable |
| 5.2.4g | The previous use or approval of a part, via JD, in any other project shall not be considered as an automatic approval for the present program.  NOTE The pertinence of the heritage in terms of mission profile and requirements can be assessed as well as all the deviations (e.g. RFDs, RFWs, special dispositions for a specific space program) previously accepted. | Modified |
| 5.2.4h | All programmable devices shall be subject to JD approval.  NOTE Programmable devices are considered are non-standard parts. | Modified |
| **5.3 Component procurement** | | |
| **5.3.1 General** | | |
| 5.3.1a |  | Applicable |
| 5.3.1b |  | Not applicable |
| 5.3.1c |  | Not applicable |
| 5.3.1d |  | Applicable |
| 5.3.1e |  | Applicable |
| 5.3.1f |  | Applicable |
| 5.3.1g |  | Applicable |
| 5.3.1h |  | Applicable |
| 5.3.1i |  | Applicable |
| 5.3.1j | Each procured EEE part shall be traceable to a manufacturer assigned trace code.   1. 1 The procurement of a single trace code per delivery lot should be preferred and encouraged. 2. 2 Some passive components can be traceable with datecode only. | New |
| 5.3.1k | Each trace code shall be maintained as is through the entire supply chain including distributor.   1. As far as possible, commercial parts should be ordered in the manufacturer’s standard packing quantities or multiples thereof to avoid distributor re-packing and handling and to preserve the traceability information usually included on the original manufacturer packaging. | New |
| 5.3.1l | The supplier shall ensure that the elements of the JD in accordance with Annex F, including any action plan, are applicable to flight parts. | New |
| **5.3.2 Procurement specification** | | |
| 5.3.2a | The supplier shall procure EEE components according to controlled specifications.   1. It can be procurer’s in-house specification, a manufacturer’s drawing or a datasheet as a minimum. | Modified |
| 5.3.2b |  | Not applicable |
| 5.3.2c |  | Not applicable |
| 5.3.2d |  | Not applicable |
| 5.3.2e |  | Applicable |
| 5.3.2f |  | Applicable |
| 5.3.2g |  | Applicable |
| 5.3.2h | If additional requirements to the manufacturer are identified, they shall be specified in the procurement specification. | New |
| **5.3.3 Screening requirements** | | |
| 5.3.3a |  | Applicable |
| 5.3.3b |  | Applicable |
| 5.3.3c |  | Applicable |
| 5.3.3d | For commercial parts, screening tests shall be performed in accordance with:  Table 8–1 for ceramic capacitors chips  Table 8–2 for solid electrolyte tantalum capacitors chips  Table 8–3 for discrete parts (diodes, transistors, optocouplers)  Table 8–4 for fuses  Table 8–5 for magnetic parts  Table 8–6 for microcircuits  Table 8–7 for resistors  Table 8–8 for thermistors | Modified |
| 5.3.3e |  | Deleted |
| 5.3.3f |  | Applicable |
| 5.3.3g |  | Not applicable |
| 5.3.3h | In case of X-rays or CT scan inspection, the total dose deposited and exposure time shall not deteriorate part performance or reliability. | Applicable |
| 5.3.3.i | <<deleted>> | Deleted |
| 5.3.3.j | <<deleted>> | Deleted |
| 5.3.3.k | <<deleted>> | Deleted |
| 5.3.3.l | <<deleted>> | Deleted |

Table 5–2: <<deleted and moved as Legacy test files as Table 8–13>>

|  |  |  |
| --- | --- | --- |
| **5.3.4 Initial customer source inspection (precap)** | | |
| 5.3.4a |  | Not applicable |
| 5.3.4b |  | Not applicable |
| **5.3.5 Lot acceptance** | | |
| 5.3.5a | The supplier shall ensure that any lot/date code of EEE parts is submitted to a lot acceptance procedure, in line with applied normative system, according to the following rules: | Modified |
| 1. | Not applicable |
| 2. | Not applicable |
| 3. | Applicable |
| 5.3.5b |  | Not applicable |
| 5.3.5c |  | Applicable |
| 5.3.5d | Lot acceptance tests shall be performed in accordance with:  Table 8–1 for ceramic capacitors chips,  Table 8–2 for solid electrolyte tantalum capacitors chips  Table 8–3 for discrete parts (diodes, transistors, optocouplers)  Table 8–4 for fuses  Table 8–5 for magnetic parts  Table 8–6 for microcircuits  Table 8–7 for resistors  Table 8–8 for thermistors | New |

Figure 5‑2: <<deleted>>

Table 5–3: <<deleted and moved to Legacy test files as Table 8–14>>

|  |  |  |
| --- | --- | --- |
| **5.3.6 Final customer source inspection (buy-off)** | | |
| 5.3.6a |  | Not applicable |
| 5.3.6b |  | Not applicable |
| 5.3.6c | For commercial parts, the buy off shall be replaced by an incoming inspection at the procurement entity’s facility reported in the JD in accordance with clause 5.3.7. | Modified |
| 5.3.6d |  | Not applicable |
| **5.3.7 Incoming inspection** | | |
| 5.3.7a |  | Applicable |
| 5.3.7b |  | Applicable |
| 5.3.7c |  | Applicable |
| 5.3.7d |  | Not Applicable |
| 5.3.7e |  | Applicable |
| **5.3.8 Radiation verification testing** | | |
| 5.3.8a |  | Applicable |
| 5.3.8b |  | Applicable |
| 5.3.8c |  | Not applicable |
| 5.3.8d |  | Applicable |
| 5.3.8e |  | Applicable |
| 5.3.8f | Parts submitted to total dose test shall be screened as specified in clause 5.3.3 to be fully representative of flight parts. | New |
| **5.3.9 Destructive physical analysis** | | |
| 5.3.9a | The DPA shall be performed according to the procurement Tables Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7, Table 8–8 of Clause 8. | Modified |
| 5.3.9b |  | Not applicable |
| 5.3.9c |  | Not applicable |
| 5.3.9d | The DPA process shall be documented by a procedure to be submitted, on request, to the customer for information.   1. For guidance refer to the basic specificaton ESSC 20600 and for active parts ECSS-Q-ST-60-13 Annex H. | Modified |
| 5.3.9e |  | Applicable |
| 5.3.9f |  | Deleted |
| 5.3.9g |  | Not applicable |
| 5.3.9h |  | Applicable |
| 5.3.9i |  | Applicable |
| 5.3.9j | <<deleted>> | Deleted |
| **5.3.10 Relifing** | | |
| 5.3.10a |  | Applicable |
| 5.3.10b |  | Applicable |
| 5.3.10c | <<deleted>> | Deleted |
| 5.3.10d | <<deleted>> | Deleted |
| **5.3.11 Manufacturer’s data documentation deliveries** | | |
| 5.3.11a | The manufacturer’s or the franchised distributor’s CoC shall be delivered to the parts procurer. | Modified |
| 5.3.11b | Any other data, defined in the procurement documents, shall be delivered to the parts’ procurer in line with the purchase order. | Modified |
| 5.3.11c |  | Applicable |
| **5.4 Handling and storage** | | |
| 5.4a |  | Applicable |
| 5.4b |  | Applicable |
| 5.4c |  | Applicable |
| 5.4d |  | Applicable |
| 5.4e |  | Applicable |
| 5.4f |  | Applicable |
| 5.5g |  | Applicable |
| 5.4h |  | Applicable |
| 5.4i | Plastic encapsulated devices shall be stored in one of the following conditions:  1. Dry Nitrogen  2. Dry and ionised air with RH in a range of 15% to 20%  3. Dry packs as specified in J-STD-033 for dry pack inspection and control | New |
| **5.5 Components quality assurance** | | |
| **5.5.1 General** | | |
| 5.5.1a |  | Applicable |
| **5.5.2 Nonconformances or failures** | | |
| 5.5.2a |  | Applicable |
| 5.5.2b |  | Applicable |
| 5.5.2c |  | Applicable |
| 5.5.2d |  | Applicable |
| **5.5.3 Alerts** | | |
| 5.5.3a |  | Applicable |
| 5.5.3b |  | Applicable |
| **5.5.4 Traceability** | | |
| 5.5.4a |  | Deleted |
| 5.5.4b |  | Applicable |
| 5.5.4c |  | Applicable |
| 5.5.4d | The traceability of EEE parts during installation in equipment, shall be ensured by the supplier through maintaining the traceability to the manufacturer’s trace code number of the EEE parts actually mounted. | Modified |
| 5.5.4e | If the as built DCL has not yet been delivered, the supplier shall be able to provide this information (part type actually installed with its relevant trace code number) within one week. | Modified |
| **5.5.5 Lot homogeneity for sampling test** | | |
| 5.5.5a |  | Applicable |
| 5.5.5b |  | Applicable |
| **5.6 Specific components** | | |
| **5.6.1 General** | | |
| 5.6.1a | <<deleted>> | Deleted |
| **5.6.2 ASICs** | | |
| 5.6.2a |  | Applicable |
| **5.6.3 Hybrids** | | |
| 5.6.3a |  | Not applicable |
| 5.6.3b |  | Not applicable |
| 5.6.3c |  | Not applicable |
| **5.6.4 One time programmable and reprogrammable devices** | | |
| 5.6.4a |  | Applicable |
| 5.6.4b | <<deleted>> | Deleted |
| 5.6.4c | The programming process and the acceptance of the programmed parts may be part of PCB, for customer approval, if not indicated in the JD. | Modified |
| 5.6.4d |  | Applicable |
| 5.6.4e |  | Applicable |
| 5.6.4f |  | Applicable |
| 5.6.4g |  | Deleted |
| 5.6.4h |  | Deleted |
| **5.6.5 Microwave monolithic integrated circuits** | | |
| 5.6.5a |  | Not applicable |
| **5.6.6 Connectors** | | |
| 5.6.6a |  | Not applicable |
| **5.6.7 High Voltage Application** | | |
| 5.6.7a |  | Applicable |
| **5.6.8 Self Made Magnetics** | | |
| 5.6.8a |  | Applicable |
| 5.6.8b |  | Applicable |
| **5.7 Documentation** | | |
| 5.7a | Any result from inspection or control shall be documented (including lot acceptance, incoming, relifing and complementary tests). | Modified |

Table 5–4: Documentation for Class 2 components

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Clause** | **Customer** | **Comments** |
| New ***:*** Procedure for hot solder dip process | 5.2.2.2j | Approval | For retinning operation |
| New ***:*** Internal supplier’s specification | 5.2.3.1k | Approval | Applicable to the preliminary and final internal supplier’s specification |
| ***PAD : not applicable*** | 4.2.4 | - | - |
| New ***:*** Justification Document | 5.2.4d | Approval | - |
| ***Procedure for customer precap : not applicable*** | 4.3.4 | - | - |
| New ***:*** Procedure for construction analysis | 5.2.3.3 | Information  (on request) | - |
| New ***:*** Evaluation, screening and LAT report | 5.2.4d | Information  (on request) | - |

# Requirements for class 3 components

|  |  |  |  |
| --- | --- | --- | --- |
| **6.1 Component programme management** | | | |
| **6.1.1. General** | | | |
| 6.1.1a |  | | Deleted |
| **6.1.2 Components control programme** | | | |
| **6.1.2.1 Organization** | | | |
| 6.1.2.1a |  | | Applicable |
| **6.1.2.2 Component control plan** | | | |
| 6.1.2.2a |  | | Applicable |
| 6.1.2.2b |  | | Applicable |
| **6.1.3 Parts control board** | | | |
| 6.1.3a |  | | Applicable |
| 6.1.3b |  | | Applicable |
| 6.1.3c |  | | Applicable |
| 6.1.3d |  | | Applicable |
| **6.1.4 Declared component list** | | | |
| 6.1.4a |  | | Applicable |
| 6.1.4b |  | | Applicable |
| 6.1.4c |  | | Applicable |
| 6.1.4d |  | | Applicable |
| 6.1.4e |  | | Applicable |
| 6.1.4f |  | | Applicable |
| 6.1.4g |  | | Applicable |
| 6.1.4h |  | | Applicable |
| **6.1.5 Electrical and mechanical GSE** | | | |
| 6.1.5a |  | | Applicable |
| 6.1.5b |  | | Applicable |
| **6.1.6 EQM components** | | | |
| 6.1.6a |  | | Applicable |
| 6.1.6b |  | | Applicable |
| **6.2 Component selection, evaluation and approval** | | | |
| **6.2.1 General** | | | |
| 6.2.1a |  | | Applicable |
| 6.2.1b |  | | Applicable |
| **6.2.2 Manufacturer and component selection** | | | |
| **6.2.2.1 General rules** | | | |
| 6.2.2.1a |  | | Applicable |
| 6.2.2.1b |  | | Applicable |
| 6.2.2.1c | <<deleted and moved to 6.2.2.3a>> | | Deleted |
| 6.2.2.1d | <<deleted and moved to 6.2.2.3b>> | | Deleted |
| 6.2.2.1e | For the assessment of commercial components, the supplier shall collect the available data on the manufacturer and the component in the JD specified in the requirement 6.2.4.d.   1. It is important to check the exhaustiveness of the manufacturer documentation & data sheet with respect to the following items:  * component marking, * mechanical description, * electrical and thermal description | | New |
| 6.2.2.1f | <<deleted>> | | Deleted |
| **6.2.2.2 Parts and material restriction** | | | |
| 6.2.2.2a |  | | Applicable |
| 6.2.2.2b |  | | Applicable |
| 6.2.2.2c |  | | Applicable |
| 6.2.2.2d |  | | Applicable |
| 6.2.2.2e |  | | Applicable |
| 6.2.2.2f |  | | Applicable |
| 6.2.2.2g |  | | Applicable |
| 6.2.2.2h |  | | Applicable |
| 6.2.2.2i |  | | Applicable |
| 6.2.2.2.j |  | | Applicable |
| 6.2.2.2k |  | | Applicable |
| 6.2.2.2l |  | | Applicable |
| **6.2.2.3 Preferred sources** | | | |
| 6.2.2.3a | |  | Applicable |
| 6.2.2.3b | |  | Applicable |
| 6.2.2.3c | |  | Applicable |
| **6.2.2.4 Radiation hardness** | | | |
| 6.2.2.4a |  | | Applicable |
| 6.2.2.4b |  | | Applicable |
| 6.2.2.4c |  | | Applicable |
| 6.2.2.4d |  | | Applicable |
| 6.2.2.4e |  | | Applicable |
| 6.2.2.4f |  | | Applicable |
| 6.2.2.4g |  | | Applicable |
| 6.2.2.4h |  | | Applicable |
| 6.2.2.4i |  | | Applicable |
| **6.2.2.5 Derating** | | | |
| 6.2.2.5a |  | | Applicable |
| 6.2.2.5b |  | | Deleted |
| **6.2.2.6 Temperature range** | | | |
| 6.2.2.6a | Commercial parts shall be selected in the highest available temperature range. | | New |
| 6.2.2.6b | A minimum 10°C margin shall be used between the maximum manufacturer temperature range and the application temperature range (including worst cases). | | New |
| 6.2.2.6c | <<deleted>> | | Deleted |
| 6.2.2.6d | Operating temperature range of all commercial parts shall be greater or equal to (-40 / 85) °C. | | New |
| 6.2.2.6e | Temperature range of commercial ceramic capacitors shall be greater or equal to (-40 / 125) °C | | New |
| **6.2.3 Component evaluation** | | | |
| **6.2.3.1 General** | | | |
| 6.2.3.1a |  | | Not applicable |
| 6.2.3.1b |  | | Deleted |
| 6.2.3.1c |  | | Not applicable |
| 6.2.3.1d | An evaluation plan shall be sent to the customer for approval, and include the following elements: | | Modified |
| 1. Construction Analysis | | Applicable |
| 2. Evaluation testing | | Not applicable |
| 3. Radiation Hardness | | Applicable |
| 6.2.3.1e |  | | Applicable |
| 6.2.3.1f |  | | Applicable |
| 6.2.3.1g |  | | Applicable |
| 6.2.3.1h |  | | Applicable |
| 6.2.3.1i | The supplier shall review the evaluation results to determine their impact on the content of the lot acceptance tests. | | Modified |
| 6.2.3.1j |  | | Applicable |
| **6.2.3.2 Component manufacturer assessment** | | | |
| 6.2.3.2a |  | | Not applicable  See 6.2.2.1e |
| **6.2.3.3. Construction analysis** | | | |
| 6.2.3.3a |  | | Applicable |
| 6.2.3.3b | The Construction analysis shall be documented by a procedure to be submitted on request to the customer for information.   1. Annex H provides guidelines for microcircuits, diodes, transistors and optocouplers. | | Modified |
| 6.2.3.3c |  | | Applicable |
| **6.2.3.4 Evaluation testing** | | | |
| 6.2.3.4a |  | | Not applicable |
| 6.2.3.4b |  | | Not applicable |
| 6.2.3.4c | Evaluation tests shall be performed as specified in:  1. Table 8–1 for ceramic capacitors chips,  2. Table 8–2 for solid electrolyte tantalum capacitors chips  3. Table 8–3 for discrete parts (diodes, transistors, optocouplers)  4 Table 8–4 for fuses  5. Table 8–5 for magnetic parts  6. Table 8–6 for microcircuits  7. Table 8–7 for resistors  8. Table 8–8 for thermistors | | New |
| 6.2.3.4d | Omission of any of the elements of tests specified in Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7 and Table 8–8, or the introduction of alternative activities, shall be justified in the JD. | | New |
| 6.2.3.4.e | <<deleted>> | | Deleted |

Table 6–1: <<deleted>>

|  |  |  |
| --- | --- | --- |
| **6.2.4 Parts approval** | | |
| 6.2.4a |  | Applicable |
| 6.2.4b |  | Deleted |
| 6.2.4c |  | Applicable |
| 6.2.4d | The approval process by the customer depends on the part qualification status and shall be organized as follows: | Modified |
|  | Not applicable |
|  | Not applicable |
|  | Applicable |
| 6.2.4e | In case the evaluation results are changing the testing conditions documented in the JD, a new revision of JD shall be submitted to the customer for approval. | Modified |
| 6.2.4f |  | Applicable |
| 6.2.4g | The previous use or approval of a part, via JD, in any other project shall not be considered as an automatic approval for the present program.  NOTE The pertinence of the heritage in terms of mission profile and requirements can be assessed as well as all the deviations (e.g. RFDs, RFWs, special dispositions for a specific space program) previously accepted. | Modified |
| 6.2.4h | Hybrids, ASICs and MMICs shall be covered by JD. | Modified |
| **6.3 Component procurement** | | |
| **6.3.1 General** | | |
| 6.3.1a |  | Applicable |
| 6.3.1b |  | Not applicable |
| 6.3.1c |  | Not applicable |
| 6.3.1d |  | Applicable |
| 6.3.1e |  | Applicable |
| 6.3.1f |  | Applicable |
| 6.3.1g |  | Applicable |
| 6.3.1h | Each procured EEE part shall be traceable to a manufacturer assigned trace code.   1. 1 The procurement of a single trace code per delivery lot should be preferred and encouraged. 2. 2 Some passive components can be traceable with datecode only. | New |
| 6.3.1g | Each trace code shall be maintained as is through the entire supply chain including distributor.   1. As far as possible, commercial parts should be ordered in the manufacturer’s standard packing quantities or multiples thereof to avoid distributor re-packing and handling and to preserve the traceability information usually included on the original manufacturer packaging. | New |
| 6.3.1h | The supplier shall ensure that the elements of the JD in accordance with Annex F, including any action plan, are applicable to flight parts. | New |
| **6.3.2 Procurement specification** | | |
| 6.3.2a | The supplier shall procure EEE components according to controlled specifications.   1. It can be procurer’s in-house specification, a manufacturer’s drawing or a datasheet as a minimum. | Modified |
| 6.3.2b |  | Not applicable |
| 6.3.2c |  | Not applicable |
| 6.3.2d |  | Not applicable |
| 6.3.2e |  | Applicable |
| 6.3.2f |  | Applicable |
| 6.3.2g |  | Applicable |
| 6.3.2h | If additional requirements are specified to the manufacturer, they shall be identified in a procurement specification. | New |
| **6.3.3 Screening requirements** | | |
| 6.3.3a |  | Applicable |
| 6.3.3b |  | Applicable |
| 6.3.3c |  | Applicable |
| 6.3.3d | For commercial parts, screening tests shall be performed in accordance with:  Table 8–1 for ceramic capacitors chips  Table 8–2 for solid electrolyte tantalum capacitors chips  Table 8–3 for discrete parts (diodes, transistors, optocouplers)  Table 8–4 for fuses  Table 8–5 for magnetic parts  Table 8–6 for microcircuits  Table 8–7 for resistors  Table 8–8 for thermistors | Modified |
| 6.3.3e |  | Deleted |
| 6.3.3f |  | Deleted |
| 6.3.3g |  | Not applicable |
| 6.3.3h |  | Applicable |

Table 6–2: <<deleted>>

|  |  |  |
| --- | --- | --- |
| **6.3.4 Initial customer source inspection (precap)** | | |
| 6.3.4a |  | Applicable |
| **6.3.5 Lot acceptance** | | |
| 6.3.5a | The supplier shall ensure that any lot/date code of EEE parts is submitted to a lot acceptance procedure, in line with applied normative system, according to the following rules: | Modified |
| 1. | Not applicable |
| 2. | Not applicable |
| 3. | Applicable |
| 6.3.5b |  | Not applicable |
| 6.3.5c |  | Applicable |
| 6.3.5d | Lot acceptance tests shall be performed in accordance with:  Table 8–1 for ceramic capacitors chips  Table 8–2 for solid electrolyte tantalum capacitors chips  Table 8–3 for discrete parts (diodes, transistors, optocouplers)  Table 8–4 for fuses  Table 8–5 for magnetic parts  Table 8–6 for microcircuits  Table 8–7 for resistors  Table 8–8 for thermistors | New |

Figure 6‑1: <<deleted>>

Table 6–3: <<deleted and moved as Legacy test files Table 8–15>>

|  |  |  |
| --- | --- | --- |
| **6.3.6 Final customer inspection (buy-off)** | | |
| 6.3.6a |  | Applicable |
| **6.3.7 Incoming inspection** | | |
| 6.3.7a |  | Applicable |
| 6.3.7b |  | Applicable |
| 6.3.7c |  | Applicable |
| 6.3.7d |  | Not applicable |
| 6.3.7e |  | Applicable |
| **6.3.8 Radiation verification testing** | | |
| 6.3.8a |  | Applicable |
| 6.3.8b |  | Applicable |
| 6.3.8c |  | Not applicable |
| 6.3.8d |  | Applicable |
| 6.3.8e |  | Applicable |
| 6.3.8f | Parts submitted to total dose test shall be screened as specified in clause 5.3.3 to be fully representative of flight parts. | New |
| **6.3.9 Destructive physical analysis** | | |
| 6.3.9a | The DPA shall be performed according to the procurement Tables Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7, Table 8–8 of Clause 8. | Modified |
| 6.3.9b |  | Not applicable |
| 6.3.9c |  | Not applicable |
| 6.3.9d | The DPA process shall be documented by a procedure to be submitted, on request, to the customer for information.   1. For guidance refer to the basic specificaton ESSC 20600 and for active parts ECSS-Q-ST-60-13 Annex H. | Modified |
| 6.3.9e |  | Applicable |
| 6.3.9f |  | Deleted |
| 6.3.9g |  | Not applicable |
| 6.3.9h |  | Applicable |
| 6.3.9i |  | Applicable |
| 6.3.9j | <<deleted>> | Deleted |
| **6.3.10 Relifing** | | |
| 6.3.10a |  | Applicable |
| 6.3.10b |  | Applicable |
| 6.3.10c | <<deleted>> | Deleted |
| 6.3.10d | <<deleted>> | Deleted |
| **6.3.11 Manufacturer’s data documentation deliveries** | | |
| 6.3.11a | The manufacturer’s or the franchised distributor’s CoC shall be delivered to the parts procurer. | Modified |
| 6.3.11b | Any other data, defined in the applicable procurement documents, shall be delivered to the parts’ procurer in line with the purchase order. | Modified |
| 6.3.11c |  | Applicable |
| **6.4 Handling and storage** | | |
| 6.4a |  | Applicable |
| 6.4b |  | Applicable |
| 6.4c |  | Applicable |
| 6.4d |  | Applicable |
| 6.4e |  | Applicable |
| 6.4.f |  | Applicable |
| 6.4.g |  | Applicable |
| 6.4.h |  | Applicable |
| 6.4i | Plastic encapsulated devices shall be stored in one of the following conditions:  1. Dry Nitrogen  2. Dry and ionised air with RH in a range of 15% to 20%  3. Dry packs as specified in J-STD-033 for dry pack inspection and control | New |
| **6.5 Components quality assurance** | | |
| **6.5.1. General** | | |
| 6.5.1a |  | Applicable |
| **6.5.2 Nonconformances or failures** | | |
| 6.5.2a |  | Applicable |
| 6.5.2b |  | Applicable |
| 6.5.2c |  | Applicable |
| 6.5.2d |  | Applicable |
| **6.5.3 Alerts** | | |
| 6.5.3a |  | Applicable |
| 6.5.3b |  | Applicable |
| **6.5.4 Traceability** | | |
| 6.5.4a |  | Deleted |
| 6.5.4b |  | Applicable |
| 6.5.4c |  | Applicable |
| 6.5.4d | The traceability of EEE parts during installation in equipment, shall be ensured by the supplier through maintaining the traceability to the manufacturer’s trace code number of the EEE parts actually mounted. | Modified |
| 6.5.4e | The supplier shall be able to provide these information (part type actually installed with its relevant trace code number) within one working day (when the flight system is on launch pad) or within one week (in the other cases). | Modified |
| **6.5.5 Lot homogeneity for sampling test** | | |
| 6.5.5a |  | Applicable |
| 6.5.5b |  | Applicable |
| **6.6 Specific components** | | |
| **6.6.1 General** | | |
| 6.6.1a | <<deleted>> | Deleted |
| **6.6.2 ASICs** | | |
| 6.6.2a |  | Applicable |
| **6.6.3 Hybrids** | | |
| 6.6.3a |  | Not applicable |
| 6.6.3b |  | Not applicable |
| 6.6.3c |  | Not applicable |
| **6.6.4 One time programmable and reprogrammable devices** | | |
| 6.6.4a |  | Applicable |
| 6.6.4b | <<deleted>> | Deleted |
| 6.6.4c | The programming process and the acceptance of the programmed parts may be part of PCB, for customer approval, if not indicated in the JD. | Modified |
| 6.6.4d |  | Applicable |
| 6.6.4e |  | Applicable |
| 6.6.4f |  | Applicable |
| 6.6.4g |  | Deleted |
| 6.6.4h |  | Deleted |
| **6.6.5 Microwave monolithic integrated circuits** | | |
| 6.6.5a |  | Not Applicable |
| **6.6.6 Connectors** | | |
| 6.6.6a |  | Not applicable |
| **6.6.7 High Voltage Application** | | |
| 6.6.7a |  | Applicable |
| **6.6.8 Self Made Magnetics** | | |
| 6.6.8a |  | Applicable |
| 6.6.8b |  | Applicable |
| **6.7 Documentation** | | |
| 6.7a | Any result from inspection or control shall be documented (including lot acceptance, incoming, relifing and complementary tests). | Modified |

Table 6–4: Documentation for Class 3 components

| **Document** | **Clause** | **Customer** | **Comments** |
| --- | --- | --- | --- |
| New ***:*** Procedure for hot solder dip process | 6.2.2.2j | Approval | For retinning operation |
| ***PAD : not applicable*** | 4.2.4 | - | - |
| New ***:*** Justification Document | 6.2.4 | Approval | - |
| ***Procedure for customer precap : not applicable*** | 4.3.4 | - | - |
| New ***:*** Procedure for construction analysis | 6.2.3.3 | Information  (on request) | - |
| New ***:*** Evaluation, screening and LAT report | 6.2.4 | Information  (on request) | - |

# Quality levels

Not applicable

# Evaluation, screening and LAT tests

|  |  |  |
| --- | --- | --- |
| **8.1 General** | | |
|  | Clause 8.2 defines the evaluation, screening and lot acceptance tests applicable to several commercial parts families. These tests are requested in the previous requirements clause 4 to clause 6.  Clause 8.3 defines legacy test files which are called in Clause 8.2, for active parts. It ensures the consistency between the various issues of the ECSS-Q-ST-60-13. | New |
| 8.1a | <<deleted>> | Deleted |

Figure 8‑1: <<deleted>>

Figure 8‑2: <<deleted>>

Figure 8‑3: <<deleted>>

Figure 8‑4: <<deleted>>

Figure 8‑5: <<deleted>>

Figure 8‑6: <<deleted>>

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| --- | --- | --- |
| **8.2 Applicable Procurement test tables** | | |
| 8.2a | The Test Tables Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7, Table 8–8 shall be used for evaluation, screening and LAT of commercial parts. | New |
| 8.2b | Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process.   1. This permission is referenced in the Procurement Test Tables as “Note (a)”. | New |
| 8.2c | Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.   1. This permission is referenced in the Procurement Test Tables as “Note (b)”. | New |
| 8.2d | The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.   1. This permission is referenced in the Procurement Test Tables as “Note (c)”. | New |
| 8.2e | Outgassing test shall only be applied if all the three following conditions are met:  1. part package is based on organic material, AND  2. weight of one part > 100mg, AND  3. test required by the user program or critical applications.   1. This permission is referenced in the Procurement Test Tables as “Note (d)”. | New |
| 8.2f | Representativity data in requirement 8.2b, 8.2c and 8.2d shall comply with the following criteria:  1. Ceramic capacitors chip : same serie; same ceramic type; same range of voltage, capacitance and packages; same manufacturing plant.  2. Solid electrolyte Tantalum capacitor chips: same serie; same electrolyte; same range of voltage, capacitance and package range; same manufacturing plant.  3. Resistor chips: same serie; same range of voltage, resistance and packages; same manufacturing plant.  4. Magnetics : same serie; same rating and package range, same manufacturing plant.  5. Thermistor: same serie; same rating and package range, same manufacturing plant.  6. Discrete parts: Same manufacturing plant, same die mask for life test, same package for environmental and mechanical tests.  7. Microcircuits: Same manufacturing plant, same die mask for life test, same package for environmental and mechanical tests.  8. Fuses: same serie; same range of voltage and packages; same manufacturing plant. | New |
| 8.2g | DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.   1. 1 Representative samples are for example the highest and lowest values or the biggest package). 2. 2 This permission is referenced in the Procurement Test Tables as “Note (e)”. | New |

Table 8–1: Procurement test table for ceramic capacitors chips

| **Ceramic capacitors chips** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC21001 |  |  |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Temperature characterization | 5 | ESCC3009 8.10 |  | Note (a) |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Life Test 2000h | 40 | ESCC3009 8.6 + 8.9 | 2000 hours | Note (a) |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | 100% | ESCC3009 chart F3 |  | Note (b) |
| **AEC-Q grd 0/1** | X | X | X | LAT | DPA | 3 | ESCC21001 |  | Note (e) |
| **AEC-Q grd 0/1** | X | X |  | LAT | Life Test 1000h | 20 | ESCC3009 8.6 + 8.9 | 1000 hours | Note (c) |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC21001 |  |  |
| **No** | X | X | X | Evaluation | Temperature characterization | 5 | ESCC 3009 8.10 |  | Note (a) |
| **No** | X | X |  | Evaluation | Complete evaluation | 72 | ESCC 3009 chart F4 | Life Test : 2000h - 40 parts | Note (a) |
| **No** |  |  | X | Evaluation | Life Test 1000h | 40 | ESCC3009 8.6 + 8.9 | 1000 hours | Note (a) |
| **No** | X | X | X | Screening | Complete screening | 100% | ESCC3009 chart F3 |  | The sample size for the test electrical test @ hot/cold temperature (ESCC3009- 8.3.3) shall be 20 parts  Note (b) for class 2 and 3 |
| **No** | X | X | X | LAT | DPA | 3 | ESCC21001 |  |  |
| **No** | X |  |  | LAT | Complete LAT | 52 | ESCC 3009 chart F4 | Life Test : 1000h – 20 parts |  |
| **No** |  | X | X | LAT | Life Test 1000h | 20 | ESCC3009 8.6 + 8.9 | 1000 hours | Note (c) for class 3 |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–2: Procurement test table for solid electrolyte tantalum capacitors chips

| **Solid electrolyte tantalum capacitors chips** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC21001 |  |  |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Life Test 2000h | 60 | ESCC 3012 chart IV  endurance subgroup | 36 parts, 85°C @Ur, 2000h 24 parts, 125°C @Uc , 2000h | Note (a) |
| **AEC-Q grd 0/1** | x | X | X | Screening | Surge current | 100% | Surge current test | MIL-PRF-55365 cond. B or ESCC 3012 ie 9.3.1 + 9.20 |  |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | 100% | ESCC 3012 chart III |  | Note (b) |
| **AEC-Q grd 0/1** | X | X | X | LAT | DPA | 3 | ESCC21001 |  | Note (e) |
| **AEC-Q grd 0/1** | X | X |  | LAT | Life Test 1000h | 16 | ESCC 3012 chart V -Endurance subgroup | 16 parts, 85°C @Ur, 1000h | Note (c) |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC21001 |  |  |
| **No** | X | X |  | Evaluation | Complete evaluation | 108 | ESCC 3012 chart IV |  | Note (a) |
| **No** |  |  | X | Evaluation | Life Test 1000h | 16 | ESCC 3012 chart V -Endurance subgroup | 16 parts, 85°C @Ur | Note (a) |
| **No** | X | X | X | Screening | Surge current | 100% | Surge current test | MIL-PRF-55365 cond. B or ESCC 3012 ie 9.3.1 + 9.20 |  |
| **No** | X |  |  | Screening | Complete screening | 100% | ESCC 3012 chart III |  |  |
| **No** |  | X | X | Screening | burn-in | 100% | MIL-PRF-55365 4.7.5 | 40h; Vrated, 85°C | Note (b) |
| **No** | X | X | X | LAT | DPA | 3 | ESCC21001 |  |  |
| **No** | X |  |  | LAT | Complete LAT | 34 | ESCC 3012 chart V  LAT level 1 |  |  |
| **No** |  | X | X | LAT | LAT | 16 | ESCC 3012 chart V -Endurance subgroup | 16 parts, 85°C @Ur | Note (c) in class 3 |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–3: Procurement test table for discrete parts (diodes, transistors, optocouplers)

| **Discrete parts (diodes, transistors, optocouplers)** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q** | X | X | X | Evaluation | Radiation evaluation |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **AEC-Q** | X | X | X | Evaluation | Construction Analysis | 5 | i.a.w. Annex H + outgassing |  | Note (d) |
| **AEC-Q** | X |  |  | Evaluation | Life Test 2000h | 15 | TM from table 8-9 | Life test duration 2000h | Note (a) |
| **AEC-Q** | X | X | X | Screening | Hermeticity | all | TM from table 8-10 and 8-13 |  | for hermetic parts |
| **AEC-Q** | X | X | X | Screening | PIND test | all | TM from table 8-10 and 8-13 |  | for parts with cavity |
| **AEC-Q** | X |  |  | Screening | Complete screening | all | TM from table 8-10 | burn-in duration 240h | Note (b) |
| **AEC-Q** | X | X | X | LAT | RVT |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **AEC-Q** | X | X | X | LAT | Construction Analysis | 5 | i.a.w. Annex H |  |  |
| **AEC-Q** | X | X |  | LAT | Life test | 15 | TM from table 8-11 and 8-14 | Life test duration 1000h | Note (c) |
| **No** | X | X | X | Evaluation | Radiation evaluation |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | i.a.w. Annex H + outgassing |  | Note (d) |
| **No** | X | X |  | Evaluation | Complete Evaluation | see tables | TM from table 8-9 and 8-12 |  | Note (a) |
| **No** | X | X | X | Screening | Hermeticity | all | TM from table 8-10 and 8-13 |  | for hermetic parts |
| **No** | X | X | X | Screening | PIND test | all | TM from table 8-10 and 8-13 |  | for parts with cavity |
| **No** | X | X |  | Screening | Complete screening | all | TM from table 8-10 and 8-13 | 240/168h duration in class 1/2 | Note (b) in class 2 |
| **No** | X | X | X | LAT | RVT |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **No** | X | X | X | LAT | Construction Analysis | 5 | i.a.w. Annex H |  |  |
| **No** | X | X | X | LAT | Complete LAT | see tables | TM from table 8-11, 8-14, 8-15 | Life test duration 1000h | Note (c) in class3 |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–4: Procurement test table for fuses

| **Fuses** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 |  |  |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Fusion characterization | 20 | ESCC 4008 test 8.5 |  |  |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Life Test 2000h | 20 | ESCC 4008 chart F4 endurance subgroup | 2000h at 125°C and rated current specified at 125°C | Note (a) |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | all | ESCC 4008 chart F3 | 168h burn-in at 85°C and rated current specified at 85°C | Note (b) |
| **AEC-Q grd 0/1** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  | Note (e) |
| **AEC-Q grd 0/1** | X | X |  | LAT | Life test 1000h | 20 | ESCC 4008 chart F4 endurance subgroup | 1000h at 125°C and rated current specified at 125°C | Note (c) |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 |  |  |
| **No** | X | X | X | Evaluation | Fusion characterization | 20 | ESCC 4008 test 8.5 |  |  |
| **No** | X | X |  | Evaluation | Complete Evaluation | 66 | ESCC 4008 chart F4 | Life test 2000h at 125°C and rated current specified at 125°C | Note (a)  If max rating temperature is less than 125°C then the life test shall be extended to cover an equivalent life time |
| **No** |  |  | X | Evaluation | Life test 1000h | 20 | ESCC 4008 chart F4 endurance subgroup | 1000h at 125°C and rated current specified at 125°C | Note (a)  If max rating temperature is less than 125°C then the life test shall be extended to cover an equivalent life time. |
| **No** | X | X | X | Screening | Complete screening | all | ESCC 4008 chart F3 | 168h burn-in class 1 96h burn-in class 2&3 at 85°C and rated current specified at 85°C | Note (b) in class 2 & 3 |
| **No** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  |  |
| **No** | X |  |  | LAT | Complete LAT | 66 | ESCC 4008 chart F4 |  |  |
| **No** |  | X | X | LAT | Life Test 1000h | 20 | ESCC 4008 chart F4 endurance subgroup | 1000h at 125°C and rated current specified at 125°C | Note (c) in class 3  If max rating temperature is less than 125°C then the life test shall be extended to cover an equivalent life time |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–5: Procurement test table for magnetics

| **Magnetic parts** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 + outgassing test |  | Note (d) |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Life Test 2000h | 20 | ESCC 3201 chart F4 endurance subgroup | 2000h at max rated temperature and current/power | Note (a)  and  Shock and vibration level tolerance shall be compared to the application constraint to adapt the evaluation tests |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Temperature Rise test |  | ESCC 3201 Para 8.7 |  | Note (a) |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | all | ESCC 3201 chart F3 | 168h burn-in current on for high power component  Current off for low power component | Note (b)  Part is considered high power if max rated power is above 0,8W |
| **AEC-Q grd 0/1** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  | Note (e) |
| **AEC-Q grd 0/1** | X | X |  | LAT | Life test 1000h | 20 | ESCC 3201 chart F4 endurance subgroup | 1000h at max rated temperature and current/power | Note (c) |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 + outgassing test |  | Note (d) |
| **No** | X | X |  | Evaluation | Complete Evaluation | 43 | ESCC 3201 chart F4 | 2000h at max rated temperature and current/power | Note (a) |
| **No** |  |  | X | Evaluation | Life test 1000h | 20 | ESCC 3201 chart F4 endurance subgroup | 1000h at max rated temperature and current/power | Note (a) |
| **No** |  |  | X | Evaluation | Temperature Rise test + thermal shocks | 10 | ESCC 3201 Para 8.7 + 8,2 | 100 cycles | Note (a) |
| **No** | X | X |  |  | Complete screening | all | ESCC 3201 chart F3 | 168/96h burn-in class ½  current on for high power component  Current off for low power component 25 cycles thermal cycles | Note (b) in class 2  Part is considered high power if max rated power is above 0,8W |
| **No** |  |  | X | Screening | Thermal Shocks | all | ESCC 3201 para 8,2 | 25 cycles | Note (b) |
| **No** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  |  |
| **No** | X |  |  | LAT | Complete LAT | 43 | ESCC 3201 chart F4 | 1000h at max rated temperature and current/power | Note (c) |
| **No** |  | X | X | LAT | Life Test 1000h | 20 | ESCC 3201 chart F4 endurance subgroup | 1000h at max rated temperature and current/power | Note (c) in class 3 |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–6: Procurement test table for microcircuits

| **Microcircuits** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Radiation evaluation |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | i.a.w. Annex H + outgassing |  | Note (d) |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Life Test 2000h | 15 | TM from Table 8-9 | 2000h LT | Note (a) |
| **AEC-Q grd 0/1** | X | X | X | Screening | Hermeticity | all | TM from Table 8-10 and 8-13 |  | for hermetic parts |
| **AEC-Q grd 0/1** | X | X | X | Screening | PIND test | all | TM from Table 8-10 and 8-13 |  | for parts with cavity |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | all | TM from Table 8-10 | 240h burn-in | Note (b) |
| **AEC-Q grd 0/1** | X | X | X | LAT | RVT |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **AEC-Q grd 0/1** | X | X | X | LAT | Construction Analysis | 5 | i.a.w. Annex H |  |  |
| **AEC-Q grd 0/1** | X | X |  | LAT | Life test 1000h | 15 | TM from Table 8-11 and 8-14 | 1000h LT | Note (c) |
| **No** | X | X | X | Evaluation | Radiation evaluation |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | i.a.w. Annex H + outgassing |  | Note (d) |
| **No** | X | X |  | Evaluation | Complete Evaluation | see tables | TM from Table 8-9 and 8-12 |  | Note (a) |
| **No** | X | X | X | Screening | Hermeticity | all | TM from Table 8-10 and 8-13 |  | for hermetic parts |
| **No** | X | X | X | Screening | PIND test | all | TM from Table 8-10 and 8-13 |  | for parts with cavity |
| **No** | X | X |  | Screening | Complete screening | all | TM from Table 8-10 and 8-13 | 240/168h duration in class 1/2 | Note (b) in class 2 |
| **No** | X | X | X | LAT | RVT |  | i.a.w. ECSS-Q-ST-60-15 |  |  |
| **No** | X | X | X | LAT | Construction Analysis | 5 | i.a.w. Annex H |  |  |
| **No** | X | X | X | LAT | Complete LAT | see tables | TM from Table 8-11, 8-14 and 8-15 | Life test duration 1000h | Note (c) in class 3 |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–7: Procurement test table for resistor chips

| **Resistor chips** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 |  |  |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Life Test 2000h | 54 | ESCC 4001 - Chart F4 Endurance subgroup | Life Test 2000h at 70C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (a) |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | all | ESCC 4001 - chart F3 | Burn-in for 168h at 70C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (b) |
| **AEC-Q grd 0/1** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  | Note (e) |
| **AEC-Q grd 0/1** | X | X |  | LAT | Life test 1000h | 15 | ESCC 4001 - Chart F4 Endurance subgroup | Life test 1000H at 70C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (c) |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 |  |  |
| **No** | X | X | X | Evaluation | Humidity test | 15 | IEC Publication No. 60068-2 | 40°C/95%, 100V or Vmax | Note (a)  and  For NiCr resistors only |
| **No** | X | X |  | Evaluation | Complete Evaluation | 96 | ESCC 4001 - chart F4 "Environmental + endurance" | Life test 2000H at 70°C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (a) |
| **No** |  |  | X | Evaluation | Life test 1000h | 54 | ESCC 4001 - Chart F4 Endurance subgroup | Life Test 1000h at 70°C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (a) |
| **No** | X |  |  | Screening | Complete screening | all | ESCC 4001 - chart F3 | Burn-in for 168h at 70°C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less |  |
| **No** |  | X | X | Screening | Burn-in | all | ESCC 4001 8.4+ 8.3.2 + 8.3.4 | 96h at 70°C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (b) |
| **No** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  |  |
| **No** | X |  |  | LAT | Complete LAT | 57 | ESCC 4001 - chart F4 Environmental + endurance | Life test 2000H at 70°C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less |  |
| **No** |  | X | X | LAT | Life Test 1000h | 15 | ESCC 4001 - Chart F4 Endurance subgroup | Life test 1000H at 70°C at voltage √(Pn x Rn) where Pn rated dissipation and Rn rated resistance or limiting element voltage whichever is less | Note (c) in class 3 |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

Table 8–8: Procurement test table for Thermistors

| **Thermistors** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Automotive  grade** | **Class 1** | **Class 2** | **Class  3** | **Category** | **Test type** | **Sample  size** | **Test Procedure** | **Specific Test condition** | **Note** |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 |  |  |
| **AEC-Q grd 0/1** | X |  |  | Evaluation | Endurance 2000h | 40 | ESCC 4006 - Chart F4 - Endurance subgroup | Life test 2000h at maximum rated power and temperature | Note (a) |
| **AEC-Q grd 0/1** | X | X | X | Evaluation | Resistance versus Temperature | 10 | ESCC 4006 Para 8.3.3 and 8.3.4 |  | Note (a) |
| **AEC-Q grd 0/1** | X |  |  | Screening | Complete screening | all | ESCC 4006 - Chart F3 | Burn-in 168h at maximum rated power and temperature | Note (b) |
| **AEC-Q grd 0/1** | X | X | X | LAT | Construction Analysis | 3 | ESCC 21001 |  | Note (e) |
| **AEC-Q grd 0/1** | X | X |  | LAT | Endurance 1000h | 40 | ESCC 4006 - Chart F4 - Endurance subgroup | Life test 1000h at maximum rated power and temperature | Note (c) |
| **No** | X | X | X | Evaluation | Construction Analysis | 5 | ESCC 21001 |  |  |
| **No** | X | X |  | Evaluation | Complete Evaluation | 76 | ESCC4006 - chart F4 | Thermal shock 100 cycles Condition C with an exposure time of 10 minutes at each rated temperature extreme.  Life test 2000h at maximum rated power and temperature | Note (a) |
| **No** |  |  | X | Evaluation | Endurance 1000h | 40 | ESCC 4006 - Chart F4 - Endurance subgroup | Life test 1000h at maximum rated power and temperature | Note (a) |
| **No** |  |  | X | Evaluation | Resistance versus Temperature | 10 | ESCC 4006 Para 8.3.3 and 8.3.4 |  | Note (a) |
| **No** | X |  |  | Screening | Complete screening | all | ESCC 4006 - Chart F3 | Burn-in 168h at maximum rated power and temperature |  |
| **No** |  | X | X | Screening | Burn-in | all | ESCC 4006 - 8.4 + 8.3.3 + 8.3.4 | 96h at maximum rated power and temperature | Note (b) |
| **No** | X | X | X | LAT | DPA | 3 | ESCC 21001 |  |  |
| **No** | X |  |  | LAT | Complete LAT | 76 | ESCC4006 - chart F4 | Thermal shock 100 cycles Condition C with an exposure time of 10 minutes at each rated temperature extreme.  Life test 2000h at maximum rated power and temperature |  |
| **No** |  | X |  | LAT | Endurance 1000h | 40 | ESCC 4006 - Chart F4 - Endurance subgroup | Life test 1000h at maximum rated power and temperature |  |
| **No** |  |  | X | LAT | Life Test 1000h | 20 | ESCC 4006 - Chart F4 - Life test file from Endurance subgroup | 1000h at maximum rated power and temperature | Note (c) |
| Note (a): see 8.2b: *Based on the review of representative data, as per 8.2f, the supplier may propose an adaptation and a minimization of these evaluation tests, to be submitted to customer for approval through the JD's approval process*.  Note (b): see 8.2c: *Based on representative data, as per 8.2f, collected in evaluation tests and in the JD, the supplier may propose an adaptation and a minimization of these screening tests to be submitted to customer for approval through the JD's approval process.*  Note (c): see 8.2d: *The supplier may propose an adaptation and a minimization of these LAT tests, to be submitted to customer for approval through the JD's approval process, based on representative data, as per 8.2f, on parts not older than 2 years.*  Note (d): see 8.2e: *Outgassing test shall only be applied if all the three following conditions are met:*  *1.part package is based on organic material, AND*  *2.weight of one part > 100 mg, AND*  *3.test required by the user program or critical applications.*  Note (e): see 8.2g: *DPA shall only be done on representative samples from each procurement batch in class 2 and class 3.* | | | | | | | | | |

|  |  |  |
| --- | --- | --- |
| **8.3 Legacy test files** | | |
| 8.3.a | The test methods and test files in Table 8–9, Table 8–10, Table 8–11, Table 8–12, Table 8–13. Table 8–14, Table 8–15 shall be used for the procurement of discrete and microcircuits, when they are requested in Table 8–3 and Table 8–6.   1. These test tables are inherited from the ECSS-Q-ST-60-13C with small corrections. They are used to ensure consistency between the various ECSS-Q-ST-60-13 issues. | New |

Table 8–9: Legacy test files - Evaluation tests for Class 1 components - Active parts

|  | **TEST** | **SAMPLING** | **METHOD / CRITERIA** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | Construction analysis | 5 parts | As per clause 4.2.3.3  See Annex H | - |
| **2** | Electrical characterization | 10 parts min  0 defect accepted | Electrical test under 3 T° (min, typ, max) or at using range +10 °C (whichever is higher as per 4.2.2.6). | Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **3** | External visual inspection | 10 parts min | ESCC 2055000  ESCC 2059000 |  |
| **4** | Mechanical shocks | 10 parts min | MIL STD 883 TM 2002 condition B - 50 pulses (per orientation) instead of 5 pulses (per orientation).  MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 50 shocks instead of 5 shocks, planes X1, Y1 and Z1. | Applicable to cavity package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| Vibrations | MIL-STD-883, TM 2007 condition A - 120 times (total) instead of 12 times (total) MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 120 times (total) instead of 12 times (total). |
| Constant acceleration | MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only).  For components which have a package weight of 5 grammes or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2. |
| **5** | Preconditioning  + 96h HAST (or 1000h THB 85/85) | 10 parts min | HAST 96h-130°C-85% RH (JESD22-A110 with continuous bias) or THB (JESD22-A101) Initial and final electrical test at 25°C (parameter & functional) Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Applicable to plastic package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **6** | C-SAM | 10 parts min | JEDEC J-STD-020 | To be done on the 10 parts of step 7 after the electrical test at 25°C and before preconditioning.  C-SAM test only applicable to plastic package. |
| **7** | Preconditioning + Thermal Cycling | 10 parts min | 500 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less) MIL-STD-750.  method 1051 cond.B MIL-STD-883 method 1010 cond.B Initial, intermediate (100 T/C) and final electrical tests at 25°C (parameter & functional).  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Preconditioning applicable to plastic package only.  Read & record for electrical tests as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **8** | Seal test | 10 parts min | MIL-STD-883 TM 1014 condition A or B (fine leak) and condition C (gross leak).  MIL-STD-750 TM 1071 condition H1 or H2 (fine leak) and condition C or K (gross leak with cavity) or condition E (gross leak without cavity). | Applicable to hermetic & cavity package. |
| **9** | Lifetest 2000h-125°C minimum | 10 parts min | MIL-STD-750 method 1026 & 1042  MIL-STD-883 method 1005 cond.D  Initial, intermediate (1000h) and final electrical tests at 3 T° (min, typ, max) (parameter & functional). | The lifetest duration shall be 2000h at minimum 125°C.  In case of a temperature lower than 125°C, the lifetest duration is extended i.a.w. MIL-STD-883 method 1005.  Read & record for electrical tests. as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **10** | DPA | 3 parts | As per clause 4.3.9 | To be done on 3 parts after lifetest (as per above step 4). |
| **11** | Radiation evaluation | i.a.w. ECSS-Q-ST-60-15 | See ECSS-Q-ST-60-15 | - |

Table 8–10: Legacy test files - Screening tests for Class 1 components - Active parts

|  | **TEST** | **SAMPLING** | **METHOD** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | X-rays | 100% | MIL-STD-750 method 2076 MIL-STD-883 method 2012. | The total dose deposited and exposure time shall not deteriorate part performance or reliability. |
| **2** | Serialization | 100% | Defined by the supplier. | - |
| **3** | Temperature cycling | 100% | 10 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less).  MIL-STD-750 method 1051  MIL-STD-883 method 1010 | - |
| **4** | PIND test | 100% | MIL-STD-750 method 2052 cond.A  MIL-STD-883 method 2020 cond.A | Applicable to cavity package only. |
| **5** | Initial electrical test | 100% | Electrical test (para-metrical and functional) at 25°C as per the internal supplier’s specification. | Read & record on selected parameters as per the internal supplier’s specification (see 4.2.3.1.k). |
| **6** | Burn-in | 100% | MIL-STD-750 method 1038 & 1039  MIL-STd-883 method 1015 cond.B  240h – 125°C or 445h – 105°C or 885h – 85°C | Temperature shall be < Tjmax-10°C and Tg-10°C whichever is lower.  In absence of Tj or Tg knowledge, 105°C max is required.  Ea = 0,4eV for equivalence calculation unless a different value has been demonstrated for the product.  Termination oxidation risk shall be controlled after burn-in. For discrete, HTRB and power burn-in depend on product family. |
| **7** | Final electrical test | 100% | Electrical test (para-metrical and functional) at 3 temp. as per the internal supplier’s specification. | Read & record on selected parameters as per the internal supplier’s specification (see 4.2.3.1k). |
| **8** | PDA | - | On steps 5 and 7.  Max acceptable PDA: 5% | PDA calculation applies to room temperature measurement only. |
| **9** | Seal test | 100% | MIL-STD-750 method 1071 cond H1 or H2 and C or K.  MIL-STD-883 method 1014 cond A or B and C. | Applicable to hermetic & cavity package only. |
| **10** | External visual inspection | 100% | MIL-STD-750 method 2071  MIL-STD-883 method 2009 | The MIL specs are not adapted to visual inspection of plastic encapsulated components, but can be used as reference (mainly for connection corrosion and marking acceptance).  In addition, for plastic packages, inspect for the following defects:  Package deformation/ Foreign inclusions in the package, voids and cracks in the plastic/ deformed leads. |

Table 8–11: Legacy test files - Lot acceptance tests for Class 1 components - Active parts

|  | **TEST** | **SAMPLING / CRITERIA** | **METHOD** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | Construction analysis | 5 parts | As per clause 4.2.3.3 see Annex H. | - |
| **2** | Mechanical shocks | 10 parts min  (0 defect accepted) | MIL STD 883 TM 2002 condition B - 5 pulses (per orientation)  MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 5 shocks, planes X1, Y1 and Z1. | Applicable to cavity package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| Vibrations | MIL-STD-883, TM 2007 condition A - 12 times (total).  MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 12 times (total). |
| Constant acceleration | MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only).  For components which have a package weight of 5 grammes or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used.  MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2. |
| **3** | Preconditioning  + 96h HAST (or 1000h THB 85/85) | 10 parts  0 defect accepted | HAST 96h-130°C-85%RH (JESD22-A110 with continuous bias) or THB (JESD22-A101).  Electrical test (para-metrical and functional) at 25°C as per the internal supplier’s specification.  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Applicable to plastic package.  Internal supplier’s specification (see 4.2.3.1k) |
| **4** | C-SAM | 10 parts | JEDEC J-STD-020 | To be done on the 10 parts of step 5 after the electrical test at 25°C and before preconditioning.  C-SAM test only applicable to plastic package. |
| **5** | Preconditioning  + Thermal Cycling [1] | 10 parts  0 defect accepted | 100 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less) MIL-STD-750 method 1051 cond.B MIL-STD-883 method 1010 cond.B  Electrical test (para-metrical and functional) at 25°C as per the internal supplier’s specification.  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Preconditioning applicable to plastic package only.  Internal supplier’s specification (see 4.2.3.1k) |
| **6** | Seal test | 10 parts min  (0 defect accepted) | MIL-STD-883 TM 1014 condition A or B (fine leak) and condition C (gross leak).  MIL-STD-750 TM 1071 condition H1 or H2 (fine leak) and condition C or K (gross leak with cavity) or condition E (gross leak without cavity). | Applicable to hermetic & cavity package. |
| **7** | C-SAM | 10 parts | JEDEC J-STD-020 | To be done on the 10 parts of step 5 after thermal cycling and the electrical test at 25°C.  C-SAM test only applicable to plastic package. |
| **8** | Lifetest [1] | 15 parts  0 defect accepted | 1000h – 125°C minimum  MIL-STD-750 method 1026 or 1042  MIL-STD-883 method 1005 cond.D  Initial, intermediate (1000h) and final electrical test (para-metrical and functional) at 25°C | The lifetest duration shall be 1000h at minimum 125°C.  In case of a temperature lower than 125°C, the lifetest duration is extended i.a.w. MIL-STD-883 method 1005.  Can be reduced to 1000h if data 2000h are available (DC less than 2 years) and no technology change occurred.  Read & record and drift calculation on selected parameters as per the internal supplier’s specification (see 4.2.3.1k). |
| **9** | External visual inspection | 10 parts min | ESCC 2055000  ESCC 2059000 |  |
| **10** | Radiation Verification Test [1] | i.a.w.  ECSS-Q-ST-60-15 | See ECSS-Q-ST-60-15 | - |
| [1] : Lifetest, thermal cycling and radiation verification test are performed on screened parts (see 4.3.3). | | | | |

Table 8–12: Legacy test files - Evaluation tests - Class 2 components - Active parts

|  | **TEST** | **SAMPLING** | **METHOD / CRITERIA** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | Construction analysis | 5 parts | As per clause 5.2.2.3  See Annex H | - |
| **2** | Electrical characterization | 10 parts min  0 defect accepted | Electrical test under 3 T° (min, typ, max) or at using range +10 °C (whichever is higher as per 4.2.2.6). | Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **3** | External visual inspection | 10 parts min | ESCC 2055000  ESCC 2059000 |  |
| **4** | Mechanical shocks | 10 parts min  0 defect accepted | MIL STD 883 TM 2002 condition B - 50 pulses (per orientation) instead of 5 pulses (per orientation).  MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 50 shocks instead of 5 shocks, planes X1, Y1 and Z1. | Applicable to cavity package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| Vibrations | MIL-STD-883, TM 2007 condition A - 120 times (total) instead of 12 times (total).  MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 120 times (total) instead of 12 times (total). |
| Constant acceleration | MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only).  For components which have a package weight of 5 grammes or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used.  MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2. |
| **5** | Preconditioning  + 96h HAST (or 1000h THB 85/85) | 10 parts min | HAST 96h-130°C-85%RH (JESD22-A110 with continuous bias) or THB (JESD22-A101) Initial and final electrical test at 25°C (parameter & functional) Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Applicable to plastic package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **6** | C-SAM | 10 parts min | JEDEC J-STD-020 | To be done on the 10 parts of step 7 after the electrical test at 25°C and before preconditioning.  C-SAM test only applicable to plastic package. |
| **7** | Preconditioning + Thermal Cycling | 10 parts min  0 defect accepted | 500 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less) MIL-STD-750.  method 1051 cond.B MIL-STD-883 method 1010 cond.B Initial, intermediate (100 T/C) and final electrical tests at 25°C (parameter & functional).  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Preconditioning applicable to plastic package only.  Read & record for electrical tests as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **8** | Seal test | 10 parts min  0 defect accepted | MIL-STD-883 TM 1014 condition A or B (fine leak) and condition C (gross leak).  MIL-STD-750 TM 1071 condition H1 or H2 (fine leak) and condition C or K (gross leak with cavity) or condition E (gross leak without cavity). | Applicable to hermetic & cavity package. |
| **9** | Lifetest 2000h-125°C minimum | 10 parts min  0 defect accepted | MIL-STD-750 method 1026 & 1042.  MIL-STD-883 method 1005 cond.D Initial, intermediate (1000h) and final electrical tests at 3 T° (min, typ, max) (parameter & functional). | The lifetest duration shall be 2000h at minimum 125°C.  In case of a temperature lower than 125°C, the lifetest duration is extended i.a.w. MIL-STD-883 method 1005.  Read & record for electrical tests. as per the preliminary issue of the internal supplier’s specification (see 4.2.3.1.k). |
| **10** | DPA | 3 parts | As per clause 4.3.9 see Annex H. | To be done on 3 parts after lifetest (as per above step 4). |
| **11** | Radiation evaluation | i.a.w.  ECSS-Q-ST-60-15 | See ECSS-Q-ST-60-15 | - |

Table 8–13: Legacy test files - Screening tests - Class 2 components - Active parts

|  | **TEST** | **SAMPLING** | **METHOD** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | Serialization | 100% | Defined by the supplier. | - |
| **2** | Temperature cycling | 100% | 10 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less).  MIL-STD-750 method 1051  MIL-STD-883 method 1010 | - |
| **3** | PIND test | 100% | MIL-STD-750 method 2052 cond.A  MIL-STD-883 method 2020 cond.A | Applicable to cavity package only. |
| **4** | Initial electrical test | 100% | Electrical test (parametrical and functional) at 25°C as per the internal supplier’s specification. | Read & record on selected parameters as per the internal supplier’s specification (see 5.2.3.1k). |
| 5 | Burn-in | 100% | MIL-STD-750 method 1038 & 1039  MIL-STD-883 method 1015 cond.B  160h – 125°C or 300h – 105°C or 590h – 85°C | Temperature shall be < Tjmax-10°C and Tg-10°C whichever is lower.  In absence of Tj or Tg knowledge, 105°C max is required.  Ea = 0,4eV for equivalence calculation unless a different value has been demonstrated for the product.  Termination oxidation risk shall be controlled after burn-in.  For discrete, HTRB and power burn-in depend on product family. |
| **6** | Final electrical test | 100% | Electrical test (para-metrical and functional) at 3 temp.as per the internal supplier’s specification. | Read & record on selected parameters as per the internal supplier’s specification (see 5.2.3.1k). |
| **7** | PDA | - | On steps 4 and 6.  Max acceptable PDA: 5% | PDA calculation applies to room temperature measurement only. |
| **8** | Seal test | 100% | MIL-STD-750 method 1071 cond H1 or H2 and C or K.  MIL-STD-883 method 1014 cond A or B and C. | Applicable to hermetic & cavity package only. |
| **9** | External visual inspection | 100% | MIL-STD-750 method 2071  MIL-STD-883 method 2009 | The MIL specs are not adapted to visual inspection of plastic encapsulated components, but can be used as reference (mainly for connection corrosion and marking acceptance).  In addition, for plastic packages, inspect for the following defects:  Package deformation/ Foreign inclusions in the package, voids and cracks in the plastic/ deformed leads. |

Table 8–14: Legacy test files - Lot acceptance tests - Class 2 components – Active parts

|  | **TEST** | **SAMPLING / CRITERIA** | **METHOD** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | Construction analysis | 5 parts | As per clause 5.2.3.3 see Annex H. |  |
| **2** | Mechanical shocks | 10 parts min  0 defect accepted | MIL STD 883 TM 2002 condition B - 5 pulses (per orientation).  MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 5 shocks, planes X1, Y1 and Z1. | Applicable to cavity package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 5.2.3.1.k). |
| Vibrations | MIL-STD-883, TM 2007 condition A - 12 times (total).  MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 12 times (total). |
| Constant acceleration | MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only).  For components which have a package weight of 5 grammes or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2. |
| **3** | Preconditioning  + 96h HAST (or 1000h THB 85/85) | 10 parts  0 defect accepted | HAST 96h-130°C-85%RH (JESD22-A110 with continuous bias) or THB (JESD22-A101).  Electrical test (para-metrical and functional) at 25°C as per the internal supplier’s specification  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Only for plastic package.  Internal supplier’s specification (see 5.2.3.1k). |
| **4** | C-SAM | 10 parts | JEDEC J-STD-020 | To be done on the 10 parts of step 5 after the electrical test at 25°C and before preconditioning.  C-SAM test only applicable to plastic package. |
| **5** | Preconditioning  + Thermal Cycling [1] | 10 parts  0 defect accepted | 100 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less) MIL-STD-750 method 1051 cond.B MIL-STD-883 method 1010 cond.B.  Electrical test (para-metrical and functional) at 25°C as per the internal supplier’s specification.  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Preconditioning applicable to plastic package only.  The necessity to perform this step will depend on the application.  Internal supplier’s specification (see 5.2.3.1k). |
| **6** | Seal test | 10 parts min  0 defect accepted | MIL-STD-883 TM 1014 condition A or B (fine leak) and condition C (gross leak).  MIL-STD-750 TM 1071 condition H1 or H2 (fine leak) and condition C or K (gross leak with cavity) or condition E (gross leak without cavity). | Applicable to hermetic & cavity package. |
| **7** | C-SAM | 10 parts | JEDEC J-STD-020 | To be done on the 10 parts of step 5 after thermal cycling and the electrical test at 25°C.  C-SAM test only applicable to plastic package. |
| **8** | Lifetest [1] | 15 parts  0 defect accepted | 1000h – 125°C minimum  MIL-STD-750 method 1026 or 1042  MIL-STD-883 method 1005 cond.D  Initial, intermediate and final electrical test (para-metrical and functional) at 25°C. | The lifetest duration shall be 1000h at minimum 125°C.  In case a temperature lower than 125°C, the lifetest duration is extended i.a.w. MIL-STD-883 method 1005.  Read & record and drift calculation on selected parameters as per the internal supplier’s specification (see 5.2.3.1k) |
| **9** | External visual inspection | 10 parts min | ESCC 2055000  ESCC 2059000 |  |
| **10** | Radiation Verification Test [1] | i.a.w.  ECSS-Q-ST-60-15 | See ECSS-Q-ST-60-15 | - |
| [1] : Lifetest, thermal cycling and radiation verification test are performed on screened parts (see 5.3.3). | | | | |

Table 8–15: Legacy test files - LAT tests - Class 3 components - Active parts

|  | **TEST** | **SAMPLING / CRITERIA** | **METHOD** | **COMMENTS** |
| --- | --- | --- | --- | --- |
| **1** | Construction analysis | 5 parts | As per clause 6.2.3.3  see Annex H | In case of retinning, step 1 shall include the SEM “QBSD” mode to check the 100% coverage of SnPb. |
| **2** | Mechanical shocks | 10 parts min  0 defect accepted | MIL STD 883 TM 2002 condition B - 5 pulses (per orientation).  MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 5 shocks, planes X1, Y1 and Z1. | Applicable to cavity package.  Read & record for electrical test as per the preliminary issue of the internal supplier’s specification (see 5.2.3.1.k). |
| Vibrations | MIL-STD-883, TM 2007 condition A - 12 times (total).  MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 12 times (total). |
| Constant acceleration | MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only).  For components which have a package weight of 5g or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2. |
| **3** | Preconditioning  + 96h HAST  (or 1000h THB 85/85) | 10 parts  0 defect accepted | HAST 96h-130°C-85%RH (JESD22-A110 with continuous bias) or THB (JESD22-A101).  Electrical test (para-metrical and functional) at 25°C as per the datasheet (selected functional tests and parameters)  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Only for plastic package.  To be done, except if representative data collected in the JD are available.  In case of retinning,  step 2 is mandatory. |
| **4** | Lifetest [1] | 15 parts  0 defect accepted | 1000h – 125°C minimum.  MIL-STD-750 method 1026 or 1042 MIL-STD-883 method 1005 cond.D.  Initial and final electrical test (parametrical and functional) at 25°C as per the datasheet (selected functional tests and parameters). | The lifetest duration shall be 1000h at minimum 125°C.  In case of a temperature lower than 125°C, the lifetest duration is extended i.a.w. MIL-STD-883 method 1005.  Electrical test on selected parameters.  To be done, except if representative data collected in the JD are available.  In case of retinning,  step 3 is mandatory. |
| **5** | C-SAM | 10 parts | JEDEC J-STD-020 | To be done on the 10 parts of step 5 after the electrical test at 25°C and before preconditioning.  C-SAM test only applicable to plastic package.  To be done, except if representative data collected in the JD are available. |
| **6** | Preconditioning  + Thermal Cycling [1] | 10 parts  0 defect accepted | 100 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less) MIL-STD-750 method 1051 cond.B.  MIL-STD-883 method 1010 cond.B.  Electrical test (para-metrical and functional) at 25°C as per the datasheet (selected functional tests and parameters).  Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole. | Preconditioning applicable to plastic package only.  To be done, except if representative data collected in the JD are available.  In case of retinning, step 5 is mandatory. |
| **7** | Seal test | 10 parts min  0 defect accepted | MIL-STD-883 TM 1014 condition A or B (fine leak) and condition C (gross leak).  MIL-STD-750 TM 1071 condition H1 or H2 (fine leak) and condition C or K (gross leak with cavity) or condition E (gross leak without cavity). | Applicable to hermetic & cavity package.  To be done, except if representative data collected in the JD are available.  In case of retinning, step 6 is mandatory. |
| **8** | C-SAM | 10 parts | JEDEC J-STD-020 | To be done on the 10 parts of step 5 after thermal cycling and the electrical test at 25°C.  C-SAM test only applicable to plastic package.  To be done, except if representative data collected in the JD are available. |
| **9** | Radiation Verification Test [1] | i.a.w. ECSS-Q-ST-60-15 | See ECSS-Q-ST-60-15 | - |
| [1] : Lifetest, thermal cycling and radiation verification test areare performed on screened parts (see 6.3.3). | | | | |

# Pure tin lead finish – risk analysis

|  |  |  |
| --- | --- | --- |
| **9.1 Overview** | | |
| 9.1 |  | Applicable |
| **9.2 Requirements** | | |
| 9.2a |  | Applicable |

1. (normative)  
   Component control plan (CCP) - DRD

|  |  |  |
| --- | --- | --- |
| **Annex A.1 DRD Identification** | | |
| **A.1.1 Requirement identification and source document** | | |
| A.1.1 |  | Applicable |
| **A.1.2 Purpose and objective** | | |
| A.1.2 |  | Applicable |
| **A.2 Expected response** | | |
| **A.2.1 Scope and content** | | |
| A.2.1a |  | Applicable |
| **A.2.2 Special remarks** | | |
| A.2.2a |  | Applicable |

1. (normative)  
   Declared components list (DCL) - DRD

|  |  |  |
| --- | --- | --- |
| **Annex B.1 DRD Identification** | | |
| **B.1.1 Requirement identification and source document** | | |
| B.1.1 |  | Applicable |
| **B.1.2 Purpose and objective** | | |
| B.1.2 |  | Applicable |
| **B.2 Expected response** | | |
| **B.2.1 Scope and content** | | |
| B.2.1a |  | Applicable |
| B.2.1b |  | Applicable |
| **B.2.2 Special remarks** | | |
| B.2.2 |  | Applicable |

1. (normative)  
   Internal Supplier’s specification - DRD

|  |  |  |
| --- | --- | --- |
| **Annex C.1 DRD Identification** | | |
| **C.1.1 Requirement identification and source document** | | |
| C.1.1 | This DRD is called up from ECSS‐Q‐ST‐60-13 requirements 4.2.3.1.l and 5.2.3.1.l. | Modified |
| **C.1.2 Purpose and objective** | | |
| C.1.2 | The purpose of the Internal Supplier’s Specification is to establish the tested parameters, test conditions, acceptance criteria, drift limits for the electrical testing during evaluation, screening and lot acceptance. | Modified |
| **C.2 Expected response** | | |
| **C.2.1 Scope and content** | | |
| C.2.1a | The internal supplier’s specification shall include or refer to the following information: | Modified |
|  | 1. | Applicable |
|  | 2. | Applicable |
|  | 3. | Applicable |
|  | 4. | Not applicable |
|  | 5. | Applicable |
|  | 6. | Applicable |
|  | 7. | Not applicable |
|  | 8. | Not applicable |
|  | 9. | Applicable |
|  | 10. | Not applicable |
|  | 11. | Not applicable |
|  | 12. | Not applicable |
|  | 13. | Not applicable |
|  | 14. | Not applicable |
|  | 15. | Not applicable |
|  | 16. | Not applicable |
|  | 17. | Not applicable |
| **C.2.2 Special remarks** | | |
| C.2.2 |  | Applicable |

1. (normative)  
   Parts approval document - DRD

|  |  |  |
| --- | --- | --- |
| **Annex D.1 DRD Identification** | | |
| **D.1.1 Requirement identification and source document** | | |
| D.1.1 |  | Not applicable |
| **D.1.2 Purpose and objective** | | |
| D.1.2 |  | Not applicable |
| **D.2 Expected response** | | |
| D.2.a |  | Not applicable |

1. (informative)  
   EEE documents delivery per review

|  |  |  |
| --- | --- | --- |
| **Annex E (informative)** | | |
| Annex E |  | Not applicable |

1. (normative)  
   Justification document - DRD

|  |  |  |
| --- | --- | --- |
| **Annex F.1 DRD Identification** | | |
| **F.1.1 Requirement identification and source document** | | |
| F.1.1 | This DRD is called up from requirements 4.2.4.d, 5.2.4.d and 6.2.4.d. | New |
| **F.1.2 Purpose and objective** | | |
| F.1.2 | The JD is a control document the objective of which is to identify the component and to provide information about it , its evaluation and its acceptability w.r.t.:  • component/ manufacturer data  • approval status  • evaluation tests  • procurement inspections and tests  • lot acceptance or lot verification tests  • radiation hardness data and RVT | New |
| **F.2 Expected response** | | |
| **F.2.1 Scope and content** | | |
| **F.2.1.1 General information** | | |
| F.2.1.1a | The JD shall include: | New |
|  | 1. Family/ sub-family |
| 2. Part number (commercial designation) |
| 3. Ordering information (part number description) |
| 4. Functional description |
| 5. Technology (CMOS, bipolar, etc…) |
| 6. Package |
| 7. Manufacturer |
| 8. Temperature range or AECQ grade |
| 9. AEC-Q |
| 10 Other qualification |
| 11. Datasheets/Procurement specification (revision, date, …) |
| 12. Application notes |
| 13. errata sheet |
| 14. Manufacturer screening & other manufacturer test on procured lot |
| 15. Manufacturer parts traceability (trace-code, date-code, assembly plant, wafer fab, diffusion lot, die revision and mask set, process name) |
| 16. PCN (Service & for selected parts) |
| 17. Obsolescence management (Yes/No) |
| 18. Moulding characteristics (Tg) |
| 19. Moisture sensitivity level |
| 20. ESD level |
| 21. Lead finish |
| 22. In case of pure tin finish, JESD-201 Class 2 qualified (Yes/No) |
| 23. Justification of the need in class 1. |
| **F.2.1.2 Supporting data** | | |
| F.2.1.2a | The JD shall include: | New |
| 1. Traceability information (e.g. assembly plant, wafer fab, die revision) for the data given below. |
| 2. Construction analysis report |
| 3. Mechanical shocks results (in case of sensitive parts) |
| 4. Vibration results (in case of sensitive parts) |
| 5. Constant acceleration results (in case of sensitive parts) |
| 6. Seal tests results (in case of hermetic & cavity package) |
| 7. Humidity test results such as HAST (96h – 130°C – 85% RH) or THB (1000h – 85°C – 85% RH) |
| 8. Thermal cycling test results (up to 500 cycles, -55°C /+125°C) |
| 9. Lifetest / HTOL results (up to 2000h - 125°C) |
| 10. Other test results (if any) |
| 11. Infant mortality data (EFR computation) – recommended |
| F.2.1.2b | When applicable the JD shall contain the following supporting radiation data:  1. TID (Total Ionizing Dose) data  2. DD (Displacement Damage) data  3. SEE (Single Event Effect) data | New |
| **F.2.1.3 Evaluation plan** | | |
| F.2.1.3a | The JD shall include: | New |
| 1. Evaluation plan with flow diagram |
| 2. Preliminary and final internal supplier’s specification |
| **F.2.1.4 Additional test on flight lot** | | |
| F.2.1.4a | The JD shall include LAT /screening and RVT plan with flow diagram and test conditions and acceptance criteria (including drift calculation). | New |
| **F.2.1.5 Procurement data** | | |
| F.2.1.5a | The JD shall include traceability information (trace-code, date-code, assembly plant, wafer fab, diffusion lot and die revision). | New |
| **F.2.1.6 Approval status** | | |
| F.2.1.6a | The JD shall include the approval status. | New |
| **F.2.1.7 Appendix** | | |
| F.2.1.7a | The JD shall include: | New |
| 1. A copy of the procurement specification / data sheet |
| 2. Traceability information (CoC, PCN) |
| **F.2.2 Special remarks** | | |
| F.2.2 | None | New |

1. <<deleted>>
2. (informative)  
   Flow chart for construction analysis
   1. Overview

This annex is a guideline for Construction Analysis (CA) and Destructive Physical Analysis (DPA) sequences to be adapted on a case by case basis for specific products/ technologies as DSM, BGA packages. Construction analysis goals are specifically oriented: quality/ reliability aspects, detection of counterfeit parts, identification of lead finish (RoHs).

Destructive Physical Analysis allow evaluating impact of life test or long duration storage on the parts.

* 1. <<deleted>>

: <<deleted>>

* 1. Construction analysis sequence

: Construction analysis sequence

| **TEST** | **SN1** | **SN2** | **SN3** | **SN4** | **SN5** | **PROCEDURE** | **COMMENTS** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| External visual inspection | **X** | **X** | **X** | **X** | **X** | MIL-STD-750 method 2071  MIL-STD-883 method 2009 | MIL specifications are not fitted to visual inspection of PED but can be used as reference (Note 1) |
| X-ray inspection | **X** | **X** | **X** | **X** | **X** | MIL-STD-750 method 2076  MIL-STD-883 method 2012 | - |
| C-SAM test | **X** | **X** | **X** | **X** | **X** | JEDEC J-STD-020 | Only applicable to plastic package |
| Permanence of marking | **X** | **X** | **X** | **X** | **X** | ESCC 24800 | - |
| PIND test  (cavity package) | **X** | **X** | **X** | **X** | **X** | MIL-STD-750 method 2052  MIL-STD-883 method 2020 | - |
| Hermeticity (cavity package) |  |  | **X** | **X** | **X** | MIL-STD-750 method 1071  MIL-STD-883 method 1014 | - |
| Residual gas analysis (cavity package) |  |  | **X** | **X** | **X** | MIL-STD-750 Method 1018  MIL-STD-883 Method 1018 | 5000 ppm H2O max at 100°C |
| Lead finish analysis and pure tin identification | **X** | **X** |  |  |  | Energy Dispersive X-ray analysis (EDX), X‑ray fluorescence, Microfluorescence, Differential Scanning Calorimeter (DSC) | Analysis to identify lead finish  w.r.t. RoHs problematic |
| Solderability | **X** | **X** |  |  |  | MIL-STD-750 method 2026  MIL-STD-883 method 2003 | - |
| Terminal strength | **X** | **X** |  |  |  | MIL-STD-750 Method 2036  MIL-STD-883 Method 2004 | - |
| Delidding | **X** | **X** | **X** | **X** |  | - | - |
| Internal visual inspection | **X** | **X** | **X** | **X** |  | ESCC 2045000  ESCC 2045010  ESCC 2059000 | The die revision shall be identified and recorded |
| SEM inspection | **X** | **X** |  |  |  | MIL-STD-750 method 2077  MIL-STD-883 method 2018 | To verify the quality of wire bonding, glassivation integrity, die interconnect metallization |
| Bond strength  (for wedged bonding) | **X** | **X** | **X** |  |  | MIL-STD-750 method 2037  MIL-STD-883 method 2011 | - |
| Bond shear (for ball bonding) | **X** | **X** | **X** |  |  | JEDEC JASD22-B116 | - |
| Glassivation integrity |  | **X** | **X** | **X** |  | MIL-STD-883 method 2021 | Make sure that the chemical etchant is suitable for the metallization |
| Die shear test  (cavity package) | **X** | **X** | **X** |  |  | MIL-STD-750 method 2017  MIL-STD-883 method 2019 | - |
| Package level  cross-sectioning |  |  |  |  | **X** | Micro-sectioning of leads shall be performed to assess presence and characteristics of the under-layer | Including die micro-sectioning |
| Visual, SEM and material analysis |  |  |  |  | **X** | - | - |
| Note 1: In addition to MIL specification criteria, inspect for any evidence of:   * + Package deformation   + Foreign inclusions in the package, voids and cracks in the plastic encapsulant   + Deformed leads, peeling, blistering or corrosion of finishing   + Legibility and correctness of marking   + Homogeneity of the lot (package level) | | | | | | | |

* 1. <<deleted>>

Bibliography

|  |  |
| --- | --- |
| ECSS-S-ST-00 | ECSS system - Description, implementation and general requirements |