

TECHNICAL SPECIFICATION



**Process management for avionics – Management plan –
Part 1: Preparation and maintenance of an electronic components management
plan**

(<https://standards.iteh.ai>)

Document Preview

IEC TS 62239-1:2015

<https://standards.iteh.ai/catalog/standards/iec/831/iec6fd-0264-402d-bffa-c6048ec69e27/iec-ts-62239-1-2015>

WITHDRAWN



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

TECHNICAL SPECIFICATION



**Process management for avionics – Management plan –
Part 1: Preparation and maintenance of an electronic components management
plan**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 03.100.50; 31.020; 49.060

ISBN 978-2-8322-2608-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviations	7
3.1 Terms and definitions.....	8
3.2 Abbreviations.....	12
4 Technical requirements	13
4.1 General.....	13
4.2 Component selection	14
4.2.1 General.....	14
4.2.2 Application conditions for use	14
4.2.3 Availability and durability	14
4.2.4 Additional performance	14
4.2.5 Component identification	14
4.3 Component application	15
4.3.1 General.....	15
4.3.2 Electromagnetic compatibility (EMC).....	15
4.3.3 Derating and stress analysis.....	15
4.3.4 Thermal analysis.....	16
4.3.5 Mechanical analysis.....	17
4.3.6 Testing, testability, and maintainability.....	17
4.3.7 Avionics radiation environment.....	18
4.3.8 Management of lead-free termination finish and soldering.....	18
4.3.9 Counterfeited, fraudulent and recycled component avoidance.....	18
4.3.10 Moisture and corrosion.....	19
4.3.11 Additional customer related application requirements	19
4.4 Component qualification.....	19
4.4.1 General.....	19
4.4.2 Minimum component qualification requirements	20
4.4.3 Original component manufacturer quality management	20
4.4.4 Original component manufacturer process management approval.....	20
4.4.5 Demonstration of component qualification.....	20
4.4.6 Qualification of components from a supplier that is not qualified	22
4.4.7 Distributor process management approval	22
4.4.8 Subcontractor assembly facility quality and process management approval	23
4.5 Continuous component quality assurance	23
4.5.1 General quality assurance requirements	23
4.5.2 On-going component quality assurance	23
4.5.3 Plan owner in-house continuous monitoring	24
4.5.4 Component design and manufacturing process change monitoring	24
4.6 Component dependability.....	25
4.6.1 General.....	25
4.6.2 Component availability and associated risk assessment	25
4.6.3 Component obsolescence	25

4.6.4	Proactive measures	26
4.6.5	Component obsolescence awareness	26
4.6.6	Reporting	26
4.6.7	Semiconductor reliability and wear out	26
4.6.8	Reliability assessment	26
4.7	Component compatibility with the equipment manufacturing process	27
4.8	Component data	27
4.8.1	General	27
4.8.2	Minimum component data requirements	28
4.9	Configuration control	28
4.9.1	General	28
4.9.2	Alternative components	29
4.9.3	Alternative sources	29
4.9.4	Equipment change documentation	29
4.9.5	Customer notifications and approvals	29
4.9.6	Focal organization	30
5	Plan administration requirements	30
5.1	Plan organization	30
5.2	Plan terms and definitions	30
5.3	Plan focal point	30
5.3.1	Primary interface	30
5.3.2	Plan focal point responsibilities	30
5.4	Plan references	30
5.5	Plan applicability	30
5.6	Plan implementation	31
5.6.1	ECMP compliance	31
5.6.2	Plan objectives	31
5.6.3	Plan owner subcontracted activities	31
5.7	Plan acceptance	31
5.8	Plan maintenance	31
Annex A (informative)	Requirement matrix for IEC TS 62239-1	32
Annex B (informative)	Typical qualification requirements and typical component minimum qualification requirements	53
Annex C (informative)	Semiconductor reliability and wear out	57
Annex D (informative)	Guidelines for environmental protection techniques and for comparison of components specifications	58
Bibliography	73
Figure 1	– Suspect components perimeter	19
Table A.1	– Requirements matrix	32
Table B.1	– Typical qualification requirements and typical component minimum qualification requirements	54
Table D.1	– Environmental protection techniques to be considered during the avionics design process	58
Table D.2	– Guidelines for the comparison of internationally available component specifications – Microcircuits	63

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PROCESS MANAGEMENT FOR AVIONICS –
MANAGEMENT PLAN –****Part 1: Preparation and maintenance of an
electronic components management plan**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62239-1, which is a technical specification, has been prepared by IEC Technical Committee 107: Process management for avionics.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the number of “shall” requirements has been rationalized;
- b) the terms “supplier”, “equipment manufacturer”, and “OEM” have been replaced by “plan owner”;
- c) the term “device” has been replaced by “component”;
- d) a requirement matrix has been included in Annex A, Table A.1;
- e) various specifications and standards have been updated;
- f) a new subclause (4.3.5.2) on mechanical stresses generated by temperature variation has been added;
- g) a new subclause (4.3.10) on moisture and corrosion has been added.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
107/245/DTS	107/258/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC TS 62239 series under the general title *Process management for avionics – Management plan*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

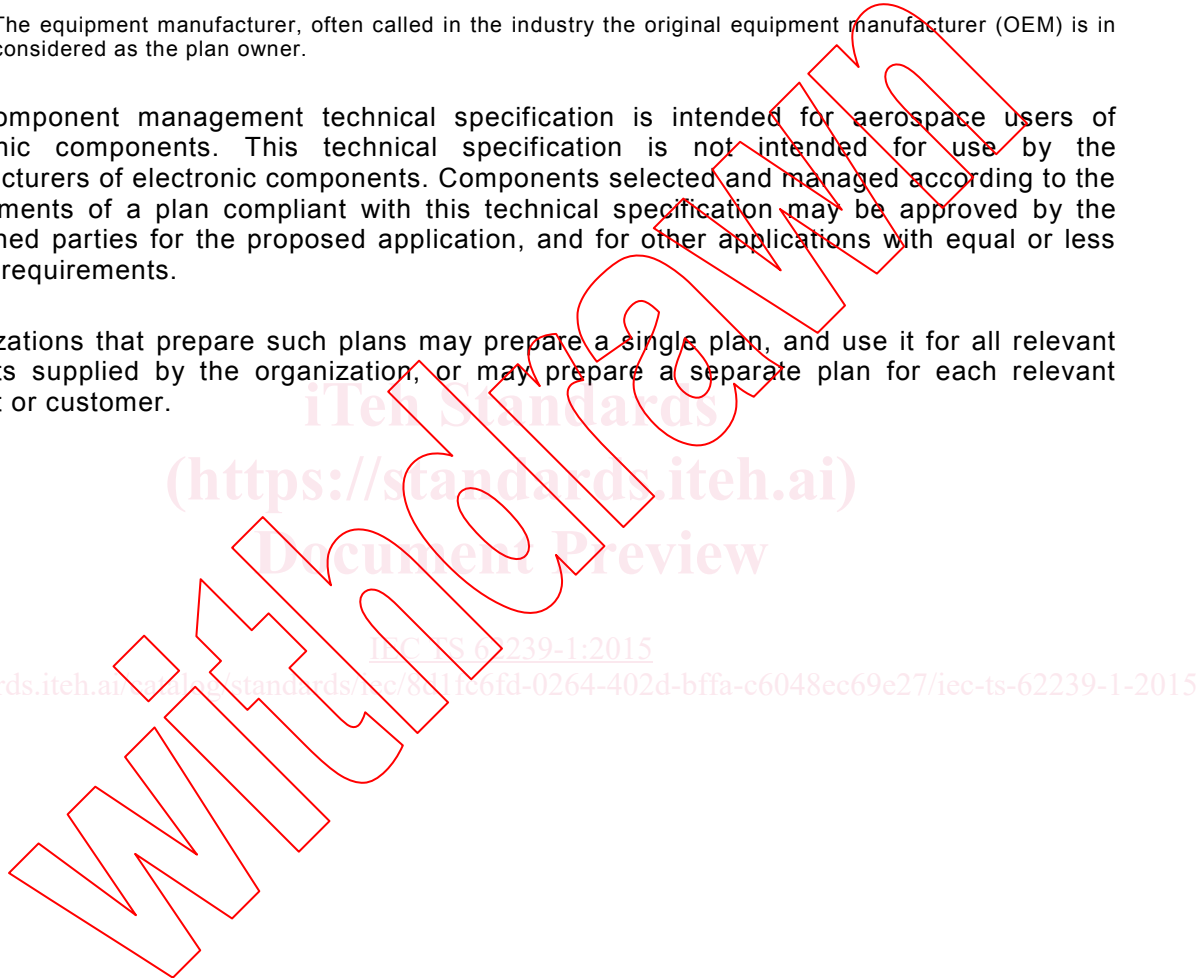
INTRODUCTION

This technical specification provides the structure for avionics equipment manufacturers, subcontractors, maintenance facilities, and other aerospace component users to develop their own Electronic Component Management Plans (ECMPs), hereinafter also referred to as 'plan'. This technical specification states objectives to be accomplished. The plan is not prescriptive and those who prepare plans in compliance with this technical specification will document processes that are the most effective and efficient for them in accomplishing the objectives of this technical specification. In order to allow flexibility in implementing and updating the documented processes, plan owners are encouraged to refer to their own internal process documents instead of including detailed process documentation within their plans.

NOTE The equipment manufacturer, often called in the industry the original equipment manufacturer (OEM) is in general considered as the plan owner.

This component management technical specification is intended for aerospace users of electronic components. This technical specification is not intended for use by the manufacturers of electronic components. Components selected and managed according to the requirements of a plan compliant with this technical specification may be approved by the concerned parties for the proposed application, and for other applications with equal or less severe requirements.

Organizations that prepare such plans may prepare a single plan, and use it for all relevant products supplied by the organization, or may prepare a separate plan for each relevant product or customer.



iteh Standards
(<https://standards.iteh.ai>)
Document Preview

[iec TS 62239-1:2015](https://standards.iteh.ai/standards/iec/831/iec6fd-0264-402d-bffa-c6048ec69e27/iec-ts-62239-1-2015)

<https://standards.iteh.ai/standards/iec/831/iec6fd-0264-402d-bffa-c6048ec69e27/iec-ts-62239-1-2015>

PROCESS MANAGEMENT FOR AVIONICS – MANAGEMENT PLAN –

Part 1: Preparation and maintenance of an electronic components management plan

1 Scope

This part of IEC 62239, which is a technical specification, defines the requirements for developing an Electronic Components Management Plan (ECMP) to assure customers that all of the electronic components in the equipment of the plan owner are selected and applied in controlled processes compatible with the end application and that the technical requirements detailed in Clause 4 are accomplished.

In general, the plan owner of a complete Electronic Components Management Plan is the avionics original equipment manufacturer (OEM).

This document provides an aid in the aerospace certification process.

Although developed for the avionics industry, this process may be applied by other industrial sectors.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62396-1:2012, *Process management for avionics – Atmospheric radiation effects – Part 1: Accommodation of atmospheric radiation effects via single event effects within avionics electronic equipment*¹

IEC TS 62647-1, *Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 1: Preparation for a lead-free control plan*

IPC/JEDEC J-STD-20, *Moisture/Reflow Sensitivity Classifications for Nonhermetic Solid State Surface Mount Devices*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

NOTE In their plan, plan owners can use alternative definitions consistent with convention in their company.

¹ A new edition is under development. It will be published soon.

3.1 Terms and definitions

3.1.1 environment

applicable environmental conditions (as described per the equipment specification) that the equipment is able to withstand without loss or degradation in equipment performance throughout its manufacturing cycle and maintenance life (the length of which is defined by the plan owner in conjunction with customers)

3.1.2 purchased

bought outside the plan owner organization, from an independent supplier

Note 1 to entry: This indicates that the plan owner does not manufacture this in-house.

3.1.3 capable

capacity of a component to be used successfully in the intended application

3.1.4 certified

assessed to and compliant with an applicable certification body

3.1.5 characterization

process of testing a sample of components to determine the key electrical parameter values that can be expected of all produced components of the type tested

3.1.6 component application

domain of use where the component meets the design requirements

3.1.7 component manufacturer

organization responsible for the component specification and its production

3.1.8 component obsolescence

absence of availability of a component which is not procurable due to the manufacturer(s) ceasing production

Note 1 to entry: Component obsolescence management is considered as an element of component dependability.

3.1.9 component qualification

process used to demonstrate that the component is capable of meeting its specification for all the required conditions and environments

3.1.10 component quality assurance

activities and processes to provide adequate confidence that each individual component meets the performance and environmental requirements

3.1.11 component selection

process of choosing a specific component for a specific application

3.1.12

component standardization

process of developing and agreeing by consensus on uniform engineering criteria for products and methods for achieving compatibility, interoperability, interchangeability, or commonality of material

Note 1 to entry: Standardization is used to reduce proliferation of components into inventory.

3.1.13

counterfeit, verb

action of simulating, reproducing or modifying a material good or its packaging without authorization

Note 1 to entry: It is the practice of producing products which are imitations or are fake goods or services. This activity infringes the intellectual property rights of the original manufacturer and is an illegal act. Counterfeiting generally relates to wilful trade mark infringement.

[SOURCE: IEC TS 62668-1:2014, 3.1.4]

3.1.14

counterfeited component

material good imitating or copying an authentic material good which may be covered by the protection of one or more registered or confidential intellectual property rights

Note 1 to entry: A counterfeited component is one whose identity or pedigree has been altered or misrepresented by its supplier.

Identity = original manufacturer, part number, date code, lot number, testing, inspection, documentation or warranty etc.

Pedigree = origin, ownership history, storage, handling, physical condition, previous use etc.

[SOURCE: IEC TS 62668-1:2014, 3.1.5]

3.1.15

fraudulent component

electronic component produced or distributed either in violation of regional or local law or regulation, or with the intent to deceive the customer

Note 1 to entry: This includes, but is not limited to the following which are examples of components which are fraudulently sold as new ones to a customer:

- (1) a stolen component;
- (2) a component scrapped by the original component manufacturer (OCM) or by any user;
- (3) a recycled component, that becomes a fraudulent recycled component when it is a disassembled component resold as new component (see Figure 1), where typically there is evidence of prior use and rework (e.g. solder, re-plating or lead re-attachment activity) on the package terminations;
- (4) a counterfeit component, copy, imitation, full or partial substitute of brands;
- (5) fraudulent designs, models, patents, software or copyright sold as being new and authentic. For example: a component whose production and distribution are not controlled by the original manufacturer;
- (6) unlicensed copies of a design;
- (7) a disguised component (re-marking of original manufacturer name, reference date/code or other identifiers etc.), which may be a counterfeit component; see Figure 1;
- (8) component without internal silicon die or with substituted silicon die which is not the original manufacturer's silicon die.

[SOURCE: IEC TS 62668-1:2014, 3.1.10]

3.1.16

dependability

capability of a product enabling it to achieve the specified functional performance at the appropriate time and for the planned duration, without damage to itself or its environment

Note 1 to entry: Dependability is generally characterised by the following four parameters: reliability, maintainability, availability, safety.

3.1.17

franchised distributor or agent

individual or corporate organization that is legally independent from the franchiser (in this case the electronic component manufacturer or OCM) and who agrees under contract to distribute products using the franchiser's name and sales network

Note 1 to entry: Distribution activities are carried out in accordance with standards set and controlled by the franchiser. Shipments against orders placed can be dispatched either direct from the OCM or the franchised distributor or agent. In other words, the franchised distributor enters into contractual agreements with one or more electronic component manufacturers to distribute and sell said components. Distribution agreements may be stipulated according to the following criteria: geographical area, type of clientele (avionics for example), maximum manufacturing lot size. Components sourced through this route are protected by the OCM's warranty and supplied with full traceability.

[SOURCE: IEC TS 62668-1:2014, 3.1.9]

3.1.18

Electronic Components Management Plan ECMP

plan owner's document that defines the processes and practices for applying components to an equipment or range of equipment and which generally addresses all relevant aspects of controlling components during system design, development, production, and post-production support

3.1.19

electronic components

electronic parts

piece parts

electrical or electronic devices that are not subject to disassembly without destruction or impairment of design use

Note 1 to entry: Resistors, capacitors, diodes, integrated circuits, hybrids, application specific integrated circuits, wound components and relays are examples of electronic component.

3.1.20

electronic equipment

functioning electronic device produced by the plan owner, which incorporates electronic components

Note 1 to entry: End items, sub-assemblies, line-replaceable units and shop-replaceable units are examples of electronic equipment.

3.1.21

flight equipment

equipment used for the active flying of the aircraft (UAV, etc.) and associated with active flying of the aircraft such as flight recorders, etc.

Note 1 to entry: This excludes equipment fitted to the aircraft not actively involved with the flying of the aircraft, such as in-flight entertainment, galley equipment, etc.

3.1.22

NAND

Negative-AND

logic gate which produces, in digital electronics, an output that is false (0) only if all its inputs are true (1) and an output true (1) if one or both inputs are false (0)

3.1.23**NOR****Negative-OR**

logic gate which produces, in digital electronics, an output that is true (1) if both the inputs are false (0) and an output false (0) if one or both inputs are true (1)

3.1.24**obsolete component**

component which is no longer manufactured, and may or may not still be available

3.1.25**package type**

generic package family describing the physical outline and lead style

Note 1 to entry: Plastic quad flat-package, ball grid array, chip scale package, SOIC package, SOT23, etc., are examples of package type.

3.1.26**plan owner**

original design authority responsible for all aspects of the design, functionality and reliability of the delivered equipment in the intended application and responsible for writing and maintaining their specific ECMP

3.1.27**recycled component**

electrical component removed from its original product or assembly and available for reuse

Note 1 to entry: The component has authentic logos, trademarks and markings. However, it typically has no output to measure the useful life remaining for its reuse. A recycled component can fail earlier than a new one when re-assembled into another product or assembly. A recycled component may also be physically or ESD damaged during the removal process.

[SOURCE: IEC TS 62668-1:2014, 3.1.17]

3.1.28**risk**

measure of the potential inability to achieve overall program objectives within defined cost, schedule, and technical constraints

3.1.29**risk management**

act or practice of dealing with risk that includes planning for risk, assessing (identifying and analysing) risk areas, developing risk handling options, monitoring risks to determine how risks have changed, and documenting the overall risk management program

3.1.30**single event effect****SEE**

response of a component caused by the impact of a single particle (for example galactic cosmic rays, solar energetic particles, energetic neutrons and protons)

Note 1 to entry: The range of responses can include both non-destructive (for example upset) and destructive (for example latch-up or gate rupture) phenomena.

[SOURCE: IEC 62396-1:2012, 3.48]

3.1.31**subcontractor assembly facilities**

location where the subcontractor conducts assembly processes and uses approved test equipment to the plan owners drawings and bills of material and test specifications without owning the intellectual property rights to the equipment

3.1.32

subcontractor

person or entity to whom the holder of obligations under a contract has delegated part or all of such obligations

3.1.33

substitute component

component used as a replacement in equipment after the equipment design has been approved

Note 1 to entry: In some contexts, the term “alternate component” is used to describe a substitute component that is equal to or better than the original component.

3.1.34

suspect component

electronic component which has lost supply chain traceability back to the original manufacturer and which may have been misrepresented by the supplier or manufacturer and may meet the definition of fraudulent or counterfeit component

Note 1 to entry: Suspect components may include but are not limited to:

- (1) counterfeit components;
- (2) recycled components coming from uncontrolled recycling operations carried outside of the OEM. Franchised network and OEM business where typically it has been fraudulently sold to the OEM as being in a new unused condition.

[SOURCE: IEC TS 62668-1:2014, 3.1.21]

3.1.35

validation

method of qualifying components at the plan owner, when no in-service data from prior use is available and there is no manufacturer’s qualification data to analyse

3.2 Abbreviations

AQEC	Aerospace qualified electronic component (see IEC TS 62564-1)
BGA	Ball grid array (related to an electronic component package)
COTS	Commercial off the shelf
DDR	Double data rate
DMSMS	Diminishing manufacturing sources and materials shortages
DPMO	Defects per million opportunities
DRAM	Dynamic random access memory
DLA	Defence Logistics Agency
DSCC	Defence Supply Centre Columbus (now known as the DLA)
ECMP	Electronic Components Management Plan
EM	Electro-migration
EMC	Electromagnetic compatibility
ESS	Environmental stress screening
FPGA	Field-programmable gate array
H3TRB	High humidity, high temperature reverse bias
HAST	Highly accelerate stress testing
HCI	Hot carrier injection
HTOL	High temperature operating life
HTRB	High temperature reverse bias