IEC TS 62686-1

Edition 2.0 2015-04

TECHNICAL SPECIFICATION

Process management for avionics – Electronic components for aerospace, defence and high performance (ADHP) applications –
Part 1: General requirements for high reliability integrated circuits and discrete semiconductors

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IEC TS 62686-1:2015-04(en)

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 03.100.50; 31.020; 49.060

ISBN 978-2-8322-2645-2

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PROCESS MANAGEMENT FOR AVIONICS – ELECTRONIC COMPONENTS FOR AEROSPACE, DEFENCE AND HIGH PERFORMANCE (ADHP) APPLICATIONS –

Part 1: General requirements for high reliability integrated circuits and discrete semiconductors

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- 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 62686-1, 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) adoption and modification of STACK Specification S/0001 revision 14 notice 3, *General requirements for integrated circuits and discrete semiconductors*;
b) update of IEC semiconductor test methods;
c) update of JEDEC semiconductor test methods; including addition of JEP148A, based on the Physics of Failure Risk and Opportunity assessment;
d) update of Annex A with additional JEDEC and IEC test information;
e) revision of lead-free termination finish requirements.

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

Enquiry draft	Report on voting
107/248/DTS	107/259/RVC

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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.

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

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A list of all the parts in the IEC 62686 series, published under the general title *Process management for avionics – Electronic components for aerospace, defence and high performance (ADHP) applications*, can be found on the IEC website.

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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.

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INTRODUCTION

This part of IEC 62686 includes all the requirements of STACK Specification S/0001 revision 14 notice 3 and contains revisions for alternative IEC qualification test methods and additional test information.

This Technical Specification complements IEC TS 62564-1 which is used for ADHP applications when additional manufacturer's data is required beyond the publicly available manufacturer published data sheets (e.g. when additional thermal performance data is required for thermally challenging applications or when additional verification data are needed, for example to comply with the requirements of RTCA DO-254/EUROCAE ED-80 for complex components for flight critical applications, etc.).

This Technical Specification can also be used to comply with the typical qualification requirements of IEC TS 62564-1. Further guidance is given in IEC TS 62239-1.

NOTE With the adoption of the STACK Specification S/0001 revision 14 notice 3 it will be possible for all existing STACK certified manufacturers to be audited by IECQ under the new STACK-IECQ joint venture.

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PROCESS MANAGEMENT FOR AVIONICS – ELECTRONIC COMPONENTS FOR AEROSPACE, DEFENCE AND HIGH PERFORMANCE (ADHP) APPLICATIONS –

Part 1: General requirements for high reliability integrated circuits and discrete semiconductors

1 Scope

This part of IEC 62686, which is a Technical Specification, defines the minimum requirements for general purpose "off the shelf" COTS (commercial off-the-shelf) integrated circuits and discrete semiconductors for ADHP (aerospace, defence and high performance) applications.

This Technical Specification applies to all components that can be operated in ADHP applications within the manufacturers' publicly available data sheet limits in conjunction with IEC TS 62239-1. It may be used by other high performance and high reliability industries, at their discretion.

ADHP application requirements may not necessarily be fulfilled by this specification alone. ADHP OEMs (original equipment manufacturers) may need to consider redesigning their products or conducting further testing to verify suitability in ADHP applications using their IEC TS 62239-1 ECMP procedures. Alternatively a component in accordance with IEC TS 62564-1 may be more suitable.

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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.

ISO 9001, *Quality management systems – Requirements*

ISO TS 16949, *Quality management systems – Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations*

ANSI/EIA-556, *Outer Shipping Container Bar Code Label Standard*

ANSI/ESD S541, *Packaging Materials Standards for ESD Sensitive Items*

AS/EN/JISQ 9100, *Aerospace series – Quality management systems – Requirements for aviation, space and defense organisations*

IPC/JEDEC J-STD-020, *Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices*

IPC/JEDEC J-STD-033, *Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices*

IPC/JEDEC J-STD-609. *Marking and Labeling of Components, PCBs and PCBAs to Identify Lead (Pb), Lead-Free (Pb-Free) and Other Attributes*

JEDEC/IPC/ECIA J-STD-048 Notification Standard for *Product Discontinuance*

JEP130, *Guidelines for Packing and Labeling of Integrated Circuits in Unit Container Packing*

JESD46, *Customer Notification of Product/Process Changes by Solid-State Suppliers*

JESD471, *Symbol and Label for Electrostatic Sensitive Devices*

TL 9000, *Quality management system*[1]

3 Terms, definitions and abbreviations

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

3.1 Terms and definitions

3.1.1
calendar days
continuous days, including weekends and holidays

3.1.2
container
outer shipping container consisting of one or more inner containers

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3.1.3
customer
user
original equipment manufacturer (OEM) which purchases electronic components, including integrated circuits and/or semiconductor devices compliant to this technical specification and uses them to design, produce, and maintain systems

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3.1.4
data sheet
document prepared by the manufacturer that describes the electrical, mechanical, and environmental characteristics of the component

3.1.5
deviation
user agreement to allow the delivery of a shipping lot which does not fully meet the requirements of this specification

Note 1 to entry: Considered equivalent to concession for the purposes of this document.

3.1.6
device specification
document written by a user and agreed by the supplier or OCM

3.1.7
form
shape, arrangement of parts, visible aspect, mode in which a part exists or manifests itself, and the material an item is constructed from

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1 For the telecommunications industry.

3.1.8
fit
fitability of an item to physically interface or interconnect with or become an integral part of another item or assembly

Note 1 to entry: Size and scale are examples of considered characteristics.

3.1.9
function
work that an item is designed to do without degrading reliability

3.1.10
incoming lot
one or more shipments of a device, grouped together for the purpose of incoming inspection

3.1.11
inner container
box or bag containing devices, either in magazines or bulk packaged

3.1.12
magazine
shipping container that feeds into automatic placement machines

Note 1 to entry: Sticks, tubes, matrix trays, tape/reel, etc. are examples of magazine.

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3.1.13
microcircuit
component
device
electrical or electronic device that is not subject to disassembly without destruction or impairment of design use and is a small circuit having a high equivalent circuit element density

Note 1 to entry: It is considered as a single part composed of interconnected elements on or within a single substrate to perform an electronic circuit function.

Note 2 to entry: This excludes printed wiring boards/printed circuit boards, circuit card assemblies and modules composed exclusively of discrete electronic components.

3.1.14
moisture sensitivity level
MSL
rating indicating a component's susceptibility to damage due to absorbed moisture when subjected to reflow soldering

3.1.15
original component manufacturer
OCM
company specifying and manufacturing the electronic component

3.1.16
room temperature
temperature identified at 25 °C ± 5 °C in a room

3.1.17
semiconductor device
electronic devices in which the characteristic distinguishing electronic conduction takes place with a semiconductor

Note 1 to entry: Semiconductor diodes are examples of semiconductor devices having two terminals and exhibiting a nonlinear voltage-current characteristic.

Note 2 to entry: Transistors are examples of active semiconductor devices capable of providing power amplification and having three or more terminals.

3.1.18
shipping lot
single lot of one or more containers received by a user

3.1.19
supplier
company which provides to another an electronic component which is identified by the logo or name marked on the device

Note 1 to entry: A supplier can be the OCM, a franchised distributor or agent, a non-franchised distributor, broker, reseller, OEM, CEM and EMS etc.

3.1.20
termination
element of a component that connects it electrically and mechanically to the next level of assembly

3.1.21
triboelectric charge
electrical charge generated by frictional movement or separation of two surfaces

3.2 Abbreviations

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AC	alternating current
ADHP	aerospace, defence and high performance
AOQ	average out-going quality
AQEC	aerospace qualified electronic component
AQL	acceptable quality level
ASIC	application specific integrated circuit
BGA	ball grid array
BPSG	borophosphosilicate glass
CB	certification body
CEM	contract electronic manufacturer
CFC	chlorofluorocarbon
COTS	commercial off–the-shelf
CMOS	complementary metal oxide semiconductor
D	semiconductor device
DC	direct current
DRAM	dynamic random access memory
DLA	Defense Logistics Agency (see http://www.dscc.dla.mil/)
DPM	defects per million
ECMP	electronic component management plan
EHS	Environmental Health and Safety
EMAS	Eco-Management and Audit Scheme (established by the European Union)
EMS	electronic manufacturing services
ESD	electrostatic sensitive damage
FFF	form, fit and function
FIT	failures in time