

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**

IEC TS 62686-1:2020

<https://standards.iteh.ai/catalog/standards/sist/d0c75902-9deb-49c0-8ac9-3d8f6e5697cf/iec-ts-62686-1-2020>



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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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 third edition cancels and replaces the second edition, published in 2015. This edition constitutes a technical revision.

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

- a) update related to obsolescence of STACK Specification S/0001 revision 14 notice 3;
- b) addition of alternative automotive methods of compliance and revision of Annex B initially related to cross-reference to STACK Specification S/0001;
- c) addition of an Annex C to include a requirement matrix for IEC TS 62686-1 verification.

The text of this Technical Specification is based on the following documents:

Draft TS	Report on voting
107/349/DTS	107/361A/RVDTS 107/361/RVDTS

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

A list of all 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.

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.

INTRODUCTION

This part of IEC 62686 includes all the requirements of the now obsolete STACK Specification S/0001 revision 14 notice 3 and also contains revisions for alternative strategies using for example automotive standards together with the option of using various qualification test methods and additional test information.

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

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

NOTE Existing STACK certified manufacturers can be audited by IECQ under the new STACK-IECQ joint venture or alternatively to the new IECQ automotive scheme.

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

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

NOTE Component qualification and outgoing quality discussed herein do not address component atmospheric radations SEE effects per IEC 62396-1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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*

JESD471, *Symbol and Label for Electrostatic Sensitive Devices*

J-STD-046, *Customer Notification of Product/Process Changes by Solid-State Suppliers*

3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

calendar days, pl.

continuous days, including week-ends and holidays

3.1.2

container

outer shipping container consisting of one or more inner containers

3.1.3

customer user

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

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 document

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 material an item is constructed from

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.

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 $25\text{ °C} \pm 5\text{ °C}$ 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 Abbreviated terms

AC	alternating current
ADHP	aerospace, defence and high performance
AEC	Automotive Electronics Council
AOQ	average outgoing quality
AQEC	aerospace qualified electronic component
AQL	acceptable quality level
ASIC	application specific integrated circuit
ATC	autoclave
BGA	ball grid array
BPSG	borophosphosilicate glass
BS	bond strength
BST	ball shear test
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
DFMEA	design failure modes and effect analysis
DLA	Defense Logistics Agency (see http://www.dsccl.dla.mil/)
DPM	defects per million
DRAM	dynamic random access memory
DS	die shear
DVP&R	design verification plan and report
ECMP	electronic component management plan
ED	electrical distribution
EHS	environmental health and safety
EM	electromigration
EMAS	Eco-Management and Audit Scheme (established by the European Union)
EMS	electronic manufacturing services
ESD	electrostatic sensitive damage
ET	electrical test
FFF	form, fit and function

FIT	failures in time
FL	flamability
GR&R	gage repeatability and reproducibility analysis
h	hour
HAST	highly accelerated stress test
HCI	hot carrier injection
HE	hermeticity
HTB	high temperature bake
HTBB	high temperature blocking bias
HTGB	high temperature gate bias
HTOL	high temperature operating life
HTRB	high temperature reverse bias
IECQ	International Electrotechnical Commission Quality Assessment System for Electronic Components
IATF	International Automotive Task Force
IC	integrated circuit
I/O	input and output
IR	infra-red
LI	lead integrity
LT	lid torque
LTB	last time buy
LTPD	lot tolerance percent defective
LU	latchup
min	minute
MOSFET	metal-oxide-semiconductor field-effect transistor
MP	marking permanency
MS	mechanical sequence
MSA	measurements system analysis
MSL	moisture sensitivity level
NBTI	negative bias temperature Instability
NMOS	n-type metal oxide-semiconductor (refers to field effect transistors (MOSFETs))
NVL	non-volatile memory operating life
OCM	original component manufacturer
OEM	original equipment manufacturer
OI	oxide integrity
PC	preconditioning
PCB	printed circuit board
PCM	process control monitor
PCN	product or process change notification
PD	package dimension
PFMEA	process failure modes and effects analysis
PGA	pin grid array
Pkg	package

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