

# TECHNICAL SPECIFICATION

**Process management for avionics – Aerospace qualified electronic components (AQEC) –  
Part 1: Integrated circuits and discrete semiconductors**

IEC TS 62564-1:2016

<https://standards.iteh.ai/catalog/standards/sist/91e7df36-5611-4824-9e37-556c81b55858/iec-ts-62564-1-2016>



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 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](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing 20 000 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](http://std.iec.ch/glossary)

65 000 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](http://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](mailto:csc@iec.ch).

INTERNATIONAL STANDARD PREVIEW  
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/62561-1-2016/iec-62561-1-2016>  
556c81b55858/iec-ts-0256-1-2016

# TECHNICAL SPECIFICATION

---

**Process management for avionics – Aerospace qualified electronic components (AQEC) –  
Part 1: Integrated circuits and discrete semiconductors**

*IEC TS 62564-1:2016*  
<https://standards.iteh.ai/catalog/standards/sist/91e7df36-5611-4824-9e37-556c81b55858/iec-ts-62564-1-2016>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 03.100.50; 31.020; 49.060

ISBN 978-2-8322-3513-3

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

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions and abbreviations .....	7
3.1 Terms and definitions .....	7
3.2 Abbreviations .....	9
4 Technical requirements.....	9
4.1 AQEC plan.....	9
4.2 AQEC documentation .....	10
4.2.1 General .....	10
4.2.2 AQEC data sheet .....	10
4.2.3 Material content .....	10
4.2.4 AQEC visibility .....	10
4.2.5 AQEC life expectancy .....	10
4.2.6 Device technology.....	11
4.2.7 SEE data .....	11
4.2.8 Termination finish .....	11
4.2.9 Third party part numbers .....	11
4.3 AQEC performance .....	12
4.3.1 Performance .....	12
4.3.2 Functional parameters .....	13
4.3.3 Known limitations .....	13
4.4 Quality system certification.....	13
4.5 Component qualification and re-qualification .....	13
4.6 AQEC quality assurance and reliability monitoring .....	13
4.7 Product change notification (PCN).....	14
4.8 Last time buy (LTB) notification .....	14
4.9 Obsolescence management.....	14
4.10 Counterfeit prevention .....	14
4.11 User or customer guide .....	14
Annex A (informative) AQEC material content and construction table .....	15
Annex B (informative) Additional desired data .....	17
Bibliography .....	18
Table A.1 – AQEC material content and construction .....	15

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PROCESS MANAGEMENT FOR AVIONICS –  
AEROSPACE QUALIFIED ELECTRONIC COMPONENTS (AQEC) –****Part 1: Integrated circuits and discrete semiconductors**

## 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 62564-1, 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 2011. This edition constitutes a technical revision.

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

- a) IEC TS 62239 changed to IEC TS 62239-1, and IEC PAS 62686-1 changed to IEC TS 62686-1;
- b) JESD48 changed to J-STD-048 and added to the Bibliography;
- c) AEC-Q100 revision G changed to AEC-Q100:2014 in 4.5 (which is now revision H);
- d) revision of AEC-Q101 removed in Bibliography;
- e) J-STD-609 for “Marking and labelling” added to the Bibliography;
- f) information added regarding components' life expectancy in 4.2.5.

GEIA-STD-0002-001 (June 2006), *Aerospace Qualified Electronic Component (AQEC) Requirements, Volume 1 – Integrated Circuits and Semiconductors*, has served as a basis for the elaboration of this technical specification.

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

Enquiry draft	Report on voting
107/276/DTS	107/283/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 parts in the IEC 62564 series, under the general title *Process management for avionics – Aerospace qualified electronic components (AQEC)*, 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.

## INTRODUCTION

Aerospace qualified electronic components (AQEC) plans are developed by manufacturers in order to document compliance with AQEC requirements. For AQEC designated components, the intention is to

- a) provide AQEC users access to information from the AQEC manufacturers that is necessary for using commercial-off-the-shelf (COTS) products;
- b) better enable AQEC users to assess whether these parts are capable of operating reliably in their applications;
- c) minimize deviations from the AQEC manufacturers' COTS products;
- d) have minimal impact on the AQEC manufacturers' standard operating or business procedures;
- e) promote communication between the AQEC manufacturers and users.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

IEC TS 62564-1:2016

<https://standards.iteh.ai/catalog/standards/sist/91e7df36-5611-4824-9e37-556c81b55858/iec-ts-62564-1-2016>

# PROCESS MANAGEMENT FOR AVIONICS – AEROSPACE QUALIFIED ELECTRONIC COMPONENTS (AQEC) –

## Part 1: Integrated circuits and discrete semiconductors

### 1 Scope

This part of IEC 62564, which is a Technical Specification, defines the minimum requirements for integrated circuits and semiconductors which are designated as an “aerospace qualified electronic component (AQEC)”. It applies to integrated circuits and semiconductors exhibiting the following attributes:

- a) a minimum set of requirements, or information provided by the part manufacturer, which will allow a standard COTS component to be designated AQEC by the manufacturer;
- b) as a minimum, each COTS component (designated AQEC) will have been designed, fabricated, assembled, and tested in accordance with the component manufacturer's requirements for standard data book components;
- c) qualification of, and quality systems for, the COTS components to be designated as AQEC should include the manufacturer's standards, operating procedures, and technical specifications. This information should be available when requested;
- d) components manufactured before the manufacturer has addressed AQEC requirements, but utilizing the same processes are also considered AQEC compliant;
- e) additional desired attributes of a device designated AQEC (that will support AQEC users) are found in Annex B of this technical specification.

NOTE Parts qualified to military specifications (except those identified as being for “logistic support” purposes only) are considered AQEC; the remainder of this technical specification only addresses non-military specification parts.

Parts qualified to AEC-Q100, grade 0 through to grade 3 are considered AQEC. For those applications where a 0 °C to +70 °C temperature range is appropriate, grade 4 is also considered to be AQEC. The users should document that the grade category used is compatible with the application in accordance with their IEC TS 62239-1 electronic components management plan (ECMP).

### 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.

IEC TS 62239-1, *Process management for avionics – Management plan – Part 1: Preparation and maintenance of an electronic components management plan*

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

IEC TS 62668-1, *Process management for avionics – Counterfeit prevention – Part 1: Avoiding the use of counterfeit, fraudulent and recycled electronic components*

ISO 9001, *Quality management systems – Requirements*



J-STD-048, *Notification Standard for Product Discontinuance*

### 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

##### **AQEC specification**

document prepared by or for the manufacturer to describe an AQEC product

Note 1 to entry: It includes a data sheet and may include other documents, such as material descriptions, environmental test procedures, quality monitoring processes, etc. It may be a stand-alone document or a clearly denoted item within a larger documentation system. There may be additional data associated with specific applications which may be requested separately.

##### 3.1.2

##### **AQEC plan**

instrument prepared by the plan owner (see 3.1.10) that clearly, concisely, and unambiguously documents the processes used by the plan owner to satisfy the requirements of this technical specification

Note 1 to entry: The plan contains auditable content.

##### 3.1.3

##### **assessment**

evaluation of a plan owner's AQEC plan to determine if it is compliant with this technical specification

##### 3.1.4

##### **microcircuit**

##### **integrated circuit**

microcircuit (device with a high circuit-element density) in which all or some of the circuit elements are inseparably associated and electrically interconnected (on one or more substrates, in a unique indivisible package) so that the microcircuit is considered to be indivisible for the purpose of construction and commerce

##### 3.1.5

##### **semiconductor**

##### **discrete semiconductor device**

semiconductor device that is specified to perform an elementary function and that is not divisible into separate components functional in themselves (for example diodes, transistors, optocouplers, LEDs and related products)

##### 3.1.6

##### **component**

##### **part**

microcircuit, integrated circuit, semiconductor or discrete semiconductor for the purpose of this specification

**3.1.7**  
**customer**  
**user**  
**designer**

original equipment manufacturer (OEM) that procures integrated circuits and/or semiconductor devices compliant with this technical specification and uses them to design, produce, and maintain systems

**3.1.8**  
**customer community**

body of customers that may act together to address issues related to this technical specification

**3.1.9**  
**data sheet**

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

**3.1.10**  
**manufacturer**  
**plan owner**

producer of integrated circuits, microcircuits, or other semiconductor devices that may be designated AQEC

Note 1 to entry: A manufacturer may produce the components directly or may oversee subcontracted manufacturing according to their own processes. The manufacturer is also the plan owner.

**3.1.11**  
**supplier**

distributor of components

[IEC TS 62564-1:2016](https://standards.iteh.ai/catalog/standards/sist/91e7df36-5611-4824-9e37-75e61b5585f8/iec-ts-62564-1-2016)

<https://standards.iteh.ai/catalog/standards/sist/91e7df36-5611-4824-9e37-75e61b5585f8/iec-ts-62564-1-2016>

Note 1 to entry: A plan for controlling AQEC inventory is in place in order to supply AQECs. A manufacturer can be a supplier in the case where no distributor is involved.

**3.1.12**  
**third party**

party designated to act on the behalf of the customer community

**3.1.13**  
**termination**

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

Note 1 to entry: A termination includes base materials and coatings (including underplates).

**3.1.14**  
**form**

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

**3.1.15**  
**fit**

qualified and competent

**3.1.16**  
**function**

work to a specification that an item is designed for without degrading reliability

### 3.2 Abbreviations

AQEC	Aerospace qualified electronic component
Bi-CMOS	Bipolar CMOS
BPSG	Borophosphosilicate glass
COTS	Commercial off the shelf
CMOS	Complementary metal oxide semiconductor
DDR	Double data rate
DRAM	Dynamic random access memory
DSCC	Defence supply centre Columbus (see <a href="http://www.dscclla.mil/">http://www.dscclla.mil/</a> )
DSIAC	Defense systems information analysis center
ECMP	Electronic component management plan
FFF	Form, fit and function
FIT	Failures in time
FPGA	Field programmable gate array
GIDEP	Government industry data exchange program
HAST	Highly accelerated stress test
HCI	Hot carrier injection
HTOL	High temperature operating life
LED	Light emitting diode
LTB	Last time buy
MCU	Multiple cell upset
MRAM	Magnetoresistive random access memory
NAND	Negation AND
NBTI	Negative bias temperature Instability
NOR	Negation OR
PBTI	Positive bias temperature instability
PCN	Product change notification
SDRAM	Synchronous dynamic random access memory
SEE	Single event effect
SEU	Single event upset
SER	Soft error rate
SEL	Single event latch
SEFI	Single event functional interrupt
SRAM	Static random access memory
SOS	Silicon on sapphire
TDDDB	Time dependant dielectric breakdown
THB	Temperature humidity bias
VID	Vendor item drawing (controlled and released by DSCC)

## 4 Technical requirements

### 4.1 AQEC plan

The processes used to ensure compliance with the following requirements shall be documented by the AQEC manufacturer and included in their AQEC plan. These requirements