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TECHNICAL SPECIFICATION

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: Integrated circuits and discrete semiconductors

FOREWORD

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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 second edition cancels and replaces the first edition published in 2009. Its main change consists of adding discrete semiconductors.

The 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
107/144/DTS	107/157/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 62564 series, under the general title *Process management for avionics – Aerospace qualified electronic components (AQEC)*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site 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- withdrawn,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 Component (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.

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 to be designated 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 shall include the manufacturer's standards, operating procedures, and technical specifications. This information shall 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 1 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.

NOTE 2 Parts qualified to AEC-Q100-Rev G, 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 user should document that the grade category used is compatible with the application in accordance with their IEC/TS 62239 (due to be replaced by future IEC/TS 62239-1) electronic components management plan (ECMP).

2 Normative references

The following referenced documents are indispensable for the application 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, *Process management for avionics – Preparation of an electronic components management plan*[1]

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

ISO 9001:2008, *Quality management systems – Requirements*

JESD48, *Product discontinuance*

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1 IEC/TS 62239-1, *Process management for avionics – Management plan – Part 1: Preparation and maintenance of an electronic components management plan,* is currently under study and will supersede IEC/TS 62239.

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 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 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

NOTE It may be conducted by IECQ, the customer, the customer's designee, or by a third party designated by the customer community.

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 it 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 (diodes, transistors, optocouplers, LEDS and related products)

3.1.6
component
part
either a microcircuit, integrated circuit, semiconductor or discrete semiconductor for the purpose of this specification

3.1.7
customer
user
designer
original equipment manufacturer (OEM) who 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 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

NOTE A plan for controlling AQEC inventory is in place in order to supply AQECs. A manufacturer can be a supplier in the case that 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 A termination includes base materials and coatings (including underplates).

3.1.14
form
shape, arrangement of parts, visible aspect, mode in which a part exists or manifests itself, the material an item is constructed from

3.1.15
fit
qualified and competent; correct size and shape

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
BPSG	Borophosphosilicate glass
COTS	Commercial off the shelf
CMOS	Complementary metal oxide semiconductor
DSCC	Defence supply centre Columbus (see http://www.dscc.dla.mil/)
ECMP	Electronic component management plan

FFF	Form, fit and function
FIT	Failures in time
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
NBTI	Negative bias temperature Instability
PCN	Product Change Notification.
SEE	Single event effect
SEU	Single event upset
SER	Soft error rate
SEL	Single event latch
SEFI	Single event functional interrupt
SOS	Silicon on sapphire
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 identify the additional processes, documentation and procedures required to supply a manufacturer's COTS part as an AQEC. The plan includes, but is not limited to, identifying data sheet parameters and/or conditions that are different for the AQEC versus the COTS part. These differences shall be identified and the data made available upon request.

4.2 AQEC documentation

4.2.1 General

For an Avionics customer, the information supplied by the AQEC manufacturer will be normally utilised and retained in accordance with the customer electronic component management plan (see IEC/TS 62239).

4.2.2 AQEC data sheet

The AQEC manufacturer shall provide and maintain under revision control a data sheet that includes operating characteristics, as well as physical characteristics. Any known environmental limitations applicable to the application being addressed (see 4.3.1.2) shall be identified. This documentation shall specify the form, fit and function for a given part number. This baseline shall not be changed without proper notification (see 4.7). Use of a unique published or posted AQEC data sheet is encouraged. As a minimum, the AQEC manufacturer shall document, individually or by family,

a) the functional operating temperature range;

b) the defined performance (mechanical and electrical) at the operating temperature range;

c) the maximum storage temperature;

d) the maximum operating junction temperature or operating case temperature;