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# TECHNICAL REPORT



colour inside

## Process management for avionics – Electronic components capability in operation – Part 1: Temperature uprating

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# PROCESS MANAGEMENT FOR AVIONICS – ELECTRONIC COMPONENTS CAPABILITY IN OPERATION –

## Part 1: Temperature uprating

## FOREWORD

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IEC/TR 62240-1, which is a technical report, has been prepared by IEC technical committee 107: Process management for avionics.

This first edition cancels and replaces IEC/TR 62240 published in 2005. This edition constitutes a technical revision.

This edition includes the following significant changes:

a) Document is revised from IEC/TR 62240 to IEC/TR 62240-1.
b) Revised wording in clauses/subclauses: Introduction and Clauses 1 to 4 including paragraph clarifications and corrections.

c) Removed all “shall” terms from document.

d) Updated paragraphs, including addition of references to the utilization of samples from a single lot, and the fact that performance of uprating is repeated if significant changes are implemented by device manufacturer, as well as the reference that the manufacturer’s warranty may be eliminated if uprating is performed.

e) Added an abbreviations subclause, 3.2.

f) Reworded 4.3.5, item b), reference pertaining to default margin of 20 °C below the absolute maximum junction temperature.

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

| Enquiry draft | Report on voting |
|---|---|
| 107/199/DTR | 107/203/RVC |

Full information on the voting for the approval of this technical report 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 62240 series, published under the general title *Process management for avionics – Electronic components capability in operation*, 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

- 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

Traditionally, industries that produced electronic equipment for ADHP (aerospace, defence and high performance) applications have relied on the military specification system for semiconductor device standards and upon manufacturers of military-specified devices as device sources. This assured the availability of semiconductor devices specified to operate over the temperature ranges required for electronic equipment in ADHP applications. In the past, several device manufacturers have exited the military market, resulting in the decreased availability of devices specified to operate over wide temperature ranges. Following are some typical ambient temperature ranges at which devices are marketed:

| | |
|---|---|
| Military: | –55 °C to + 125 °C |
| Automotive: | –40 °C to + 125 °C |
| Industrial: | –40 °C to + 85 °C |
| Commercial: | 0 °C to + 70 °C |

If there are no reasonable or practical alternatives, then a potential response is for equipment manufacturers to use devices at temperature ranges that are wider than those specified by the device manufacturer.

This technical report provides information to select semiconductor devices, to assess their capability to operate, and to assure their intended quality in the wider temperature ranges. It also reports the need for documentation of such usage.

This can be supported by exchanging technical information with the original device manufacturer.

Operation of the device beyond the manufacturer's limits may result normally in loss of warranty by the device manufacturer.

# PROCESS MANAGEMENT FOR AVIONICS – ELECTRONIC COMPONENTS CAPABILITY IN OPERATION –

## Part 1: Temperature uprating

## 1 Scope

This Technical Report provides information when using semiconductor devices in wider temperature ranges than those specified by the device manufacturer. The uprating solutions described herein are considered exceptions, when no reasonable alternatives are available; otherwise devices are utilized within the manufacturers' specifications.

The terms "uprating" and "thermal uprating" are being used increasingly in avionics industry discussions and meetings, and clear definitions are included in Clause 3. They were coined as shorthand references to a special case of methods commonly used in selecting components for circuit design.

This technical report describes the methods and processes for implementing this special case. All of the elements of these methods and processes employ existing, commonly used best engineering practices. No new or unique engineering knowledge is needed to follow these processes: only a rigorous application of the overall approach.

Even though the device is used at wider temperatures, the wider temperatures usage will be limited to those that do not compromise applications performance and reliability, particularly for devices with narrow feature size geometries (e.g., 90 nm and less). This technical report does not imply that applications use the device to function beyond the absolute maximum rating limits of the device specified by the original device manufacturer and assumes that:

– device usage outside the original device manufacturers' specified temperature ranges is done only when no reasonable alternative approach is available and is performed with appropriate justification;
– if it is necessary to use devices outside the original device manufacturers' specified temperature ranges, it is done with documented and controlled processes that assure integrity of the equipment.

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