SLOVENSKI STANDARD
SIST-TS ES 59008-4-3:2007

01-januar-2007

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Data requirements for semiconductor die -- Part 4-3: Specific requirements and recommendations - Thermal

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Ta slovenski standard je istoveten z: ES 59008-4-3:1999

ICS:

31.080.01	Polprevodniški elementi (naprave) na splošno	Semiconductor devices in general

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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN SPECIFICATION
SPÉCIFICATION EUROPÉENNE
EUROPÄISCHE SPEZIFIKATION

ES 59008-4-3

November 1999

English version

Data requirements for semiconductor die
Part 4-3: Specific requirements and recommendations - Thermal

This European Specification was approved by CENELEC on 1999-09-23.

CENELEC members are required to announce the existence of this ES in the same way as for an EN and to make the ES available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. ES 59008-4-3:1999 E

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Foreword

This European Specification has been prepared by the CENELEC BTTF 97-1, Known good die.

It was submitted to the vote during the meeting of BTTF 97-1 and approved by CENELEC as ES 59008-4-3 on 1999-09-23.

The following date was fixed:

- latest date by which the existence of the ES has to be announced at national level (doa) 2000-02-01

The structure of this European Specification is as follows.

ES 59008 Data requirements for semiconductor die
- Part 1 General requirements
- Part 2 Vocabulary
- Part 3 Mechanical, material and connectivity requirements
- Part 4 Specific requirements and recommendations
  - Part 4-1: Test and quality
  - Part 4-2: Handling and storage
  - Part 4-3: Thermal
  - Part 4-4: Electrical simulation
- Part 5 Particular requirements and recommendations for die types
  - Part 5-1: Bare die
  - Part 5-2: Bare die with added connection structures
  - Part 5-3: Minimally-packaged die
- Part 6 Exchange data formats and data dictionary
  - Part 6-1: Data exchange - DDX file format
  - Part 6-2: Data dictionary

Introduction

This European Specification has been developed to facilitate the selection of unpackaged and minimally-packaged semiconductor die, with or without connection structures in order to save both design and procurement time.

It is a data specification which defines the requirements for :

- product identity
- product data
- die mechanical information
- test, quality and reliability information
- handling, storage and mounting information
- thermal data and electrical simulation data.

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This document was prepared by CENELEC Task Force CLC/BTTF 97-1 Known Good Die. Other organisations that helped prepare it were: the ESPRIT GOOD-DIE projects, EECA, Sematech, DPC and EIAJ.

The specification was derived from the work carried out in the ESPRIT 4th Framework project GOOD-DIE. This project was set up to develop a database for the selection of unpackaged and minimally-packaged semiconductor die, with or without connection structures, and for the downloading of information to CAD design stations to facilitate the layout and simulation of MCMs and hybrid circuits. During the early part of the GOOD-DIE project the need was identified for a standard way of presenting information for the selection and procurement of these components.

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1 Scope

This series of European Specifications specifies requirements for the exchange of data pertaining to bare semiconductor die, with or without connection structures, and minimally packaged semiconductor die.

This Specification also gives recommendations for general industry good practice in the use of bare die, with or without connection structures, and minimally packaged die.

ES 59008-4-3 specifies requirements relating specifically to operational thermal conditions of unpackaged and minimally packaged semiconductor die.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this European Specification. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this European Specification are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

ES 59008-1, *Data requirements for semiconductor die -- Part 1: General Requirements*

ES 59008-2, *Data requirements for semiconductor die -- Part 2: Vocabulary*

ES 59008-3, *Data requirements for semiconductor die -- Part 3: Mechanical, material and connectivity requirements*

3 Definitions

For the purpose of this European Specification, the definitions given in ES 59008-2 apply.

4 Requirements

This Part 4-3 of ES 59008 should be read in conjunction with ES 59008-1 and ES 59008-3.

All values shall be given in SI units.

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5 Conformity levels

When any data are supplied which claim conformity to this specification, the level of conformity shall be stated as follows:

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Level 1: all data listed in **6.1** have been included.

Level 2: all data listed in **6.1**, **6.2** and/or **6.1** and **7.1** have been included.

Level 3: all data listed in **6.1, 6.2, 6.3** and/or **6.1, 6.3, 7.2** have been included.

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6 Requirements for bare die with or without added connection structures

This clause covers the requirements for bare die with or without added connection structures. However, since not all requirements are applicable to all types of die, Table 1 summarises the requirements in the first three columns where the figure shows the level of the requirement for each die type.

6.1 Essential information

In order to claim conformity with any of the levels 1, 2 or 3 all the information covered by 6.1.1 to 6.1.3 shall be given as indicated by a figure 1 in the relevant column of Table 1.

6.1.1 Operating temperature conditions

The range of normal operating temperature conditions.

6.1.2 Maximum junction temperature

The maximum allowable junction temperature for the conditions stated in 6.1.1.

6.1.3 Junction temperature range

The range of junction temperatures for the conditions stated in 6.1.1.

6.2 Desirable information

The information covered by this subclause is important and should be supplied if at all possible. In order to claim conformity with either level 2 or 3 all the information covered by 6.1.1 to 6.1.3 and 6.2.1 shall be given as indicated by a figure 1 or 2 in the relevant column of Table 1.

6.2.1 Power dissipation

Minimum, typical and maximum power dissipation values for the conditions stated in 6.1.1.

6.3 Optional information

The information covered by this subclause should be supplied whenever it is applicable and available. In order to claim conformity with level 3 all the information covered by 6.1.1 to 6.1.3, 6.2.1 and 6.3.1 to 6.3.6 shall be given as indicated by a figure 1, 2 or 3 in the relevant column of Table 1.

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6.3.1 Die surface plot

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A plot of the die surface indicating type and location of temperature sensitive areas.

6.3.2 Heat sources

The power and type of each heat source.

6.3.3 Location of heat sources

The co-ordinates of each heat source with respect to the die geometric origin, as defined in ES 59008-3.

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6.3.4 Area of heat sources

The percentage of the die surface area covered by each heat source.

6.3.5 Thermal conductivity

The thermal conductivity of the die material.

6.3.6 Specific heat capacity

The specific heat capacity of the die material.

7 Requirements for minimally-packaged die

Information as described in the following subclauses is required in addition to any relevant information as defined in clause 6. These additional requirements are shown in the last three columns of Table 1 where the figure shows the level of requirement for each item of information for bare die with added connection structures and minimally-packaged devices.

7.1 Desirable information

The information covered by this subclause is important and should be supplied if at all possible. In order to claim conformity with either level 2 or 3 all the information covered by 6.1.1 to 6.1.3 and 6.2.1 and 7.1.1 to 7.1.2, as indicated by a figure 1 or 2 in the relevant column of Table 1, shall be given.

7.1.1 Package thermal resistance

The junction-to-ambient and/or junction-to-reference thermal resistance values of the package.

7.1.2 Thermal properties of the encapsulated devices

The thermal properties of any material used for encapsulating the die, such as the thermal coefficient of expansion.

7.2 Optional information

The information covered by this subclause should be supplied whenever it is applicable and available. In order to claim conformity with level 3 all the information covered by 6.1.1 to 6.1.3, 6.2.1 and 6.3.1 to 6.3.4 and 7.1.1 to 7.1.2 and 7.2.1 to 7.2.5, as indicated by a figure 1, 2 or 3 in the relevant column of Table 1, shall be given.

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7.2.1 Thermal resistance measurement test conditions

A description of the measurement test conditions, where thermal resistance measurements have been carried out.

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7.2.2 Thermal resistance measurements ambient temperature

The ambient temperature of the environment where the thermal resistance measurements have been carried out.

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7.2.3 Reference temperature

The temperature of the reference used for the thermal resistance measurements.

7.2.4 Reference location

The location of the reference used for the thermal resistance measurements.

7.2.5 Power level

The level of power applied to the device under test during the thermal resistance measurements.

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Table 1 — Summary of information requirements (normative)

Subclause	Parameter	Bare die	Bumped die	Die with lead frame	Minimally packaged die
6.1.1	Operating temperature conditions	1	1	1	1
6.1.2	Maximum junction temperature	1	1	1	1
6.1.3	Junction temperature range	1	1	1	1
6.2.1	Power dissipation	2	2	2	2
6.3.1	Die surface plot	3	3	3	3
6.3.2	Heat sources	3	3	3	3
6.3.3	Location of heat sources	3	3	3	3
6.3.4	Area of heat sources	3	3	3	3
6.3.5	Thermal conductivity	3	3	3	3
6.3.6	Specific heat capacity	3	3	3	3
7.1.1	Package thermal resistance				2
7.1.2	Thermal properties of the encapsulated device				2
7.2.1	Thermal resistance measurement conditions				3
7.2.2	Thermal resistance measurements ambient temperature				3
7.2.3	Reference temperature				3
7.2.4	Reference location				3
7.2.5	Power level				3

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