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SIST-TS ES 59008-5-2:2007
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Data requirements for semiconductor die -- Part 5-2: Particular requirements and recommendations for die types - Bare die with added connection structures

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

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EUROPEAN SPECIFICATION **ES 59008-5-2**

SPÉCIFICATION EUROPÉENNE

EUROPÄISCHE SPEZIFIKATION March 2001

English version

Data requirements for semiconductor die Part 5-2: Particular requirements and recommendations for die types - Bare die with added connection structures

This European Specification was approved by CENELEC on 2001-02-05.

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Ref. No. ES 59008-5-2:2001 E

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 59008-5-2 on 2001-02-05.

The following date was fixed:

- latest date by which the existence of the ES has to be announced at national level (doa) 2001-06-01

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
  - Part 6-2 Data dictionary

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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 of

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

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.

This 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 European Specification 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 for handling bare die, with or without connection structures and minimally-packaged die.

ES 59008-5-2 specifies particular requirements and recommendations for bare die with connection structures, such as bumped, flip-chip or TAB mounted die including TCP (Tape Carrier Package), that are not contained elsewhere in this series of specifications. Bumped die in wafer form, sawn or unsawn, are included in this part with the exception of information that is common to die without connection structures that is contained in ES 59008-5-1.

This specification is for use by semiconductor manufacturers, suppliers, die processors and users of semiconductor die.

ES 59008-5-2 is to be read in conjunction with ES 59008-1, General requirements, and ES 59008-3, Mechanical, material and connectivity requirements, and, where relevant, ES 59008-4-1, ES 59008-4-2, ES 59008-4-3 and ES 59008-4-4

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of ES 59008-5-2.

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

ES 59008-2 *Part 2: Vocabulary*

ES 59008-3 *Part 3: Mechanical, material and connectivity requirements*

ES 59008-4-1 *Part 4-1: Specific requirements and recommendations – Test and quality*

ES 59008-4-2 *Part 4-2: Specific requirements and recommendations – Handling, assembly and storage*

ES 59008-4-3 *Part 4-3: Specific requirements and recommendations – Thermal*

ES 59008-4-4 *Part 4-4: Specific requirements and recommendations – Electrical simulation*

EIA/JESD49 *Procurement standard for Known Good Die (KGD) February 1996*

FED-STD-209 *Clean room and workstation requirements, controlled environments*

3 Definitions

For the purposes of this European Specification, the definitions given in ES 59008-2, Vocabulary, shall apply. In addition the following terms are used in this document.

3.1 Anisotropic Conductive Film (ACF**)**

conductive polymer material which, when processed, is conductive only in the vertical or 'Z' direction. Also known as 'Z axis material'

3.2 Chip on Film, Foil or Flex (COF)

semiconductor die mounted on a flexible lead-frame, similar to TAB, where bumped die are flip-chip bonded to a flexible substrate, which may be continuous. This could also be a complete circuit i.e. Radio Frequency Identification Tag

3.3 Direct Chip Attach (DCA)

combined attachment and connection of a semiconductor die, active side down, to the surface on which it is mounted

3.4 Tape Carrier Package (TCP)

semiconductor die, mounted in a similar manner to TAB, where bumped die are inner-lead bonded to a lead frame in a cutout in a tape

3.5 underfill

material used to fill the void between a flip-chip die and the surface on which it is mounted. This may be applied either before or after flip-chip mounting and may prevent the ingress of contaminants, aid heat dissipation, alleviate mismatch in thermal coefficients of expansion and can also act as an adhesive

4 Conformity levels

Conformity levels generally do not apply to this part of ES 59008. However, where any item in this part of the standard is already covered by ES 59008-3, ES 59008-4-1, ES 59008-4-2, ES 59008-4-3 or ES 59008-4-4, then the conformity requirement, as detailed, shall apply. This part provides recommendations for good industry practice when exchanging information about die. All information specific to a bare die or wafer form is included in this part and should be used as a basis for a detailed supplier or user specification.

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5 Specific recommendations – Test and quality

5.1 General

This clause contains classes of information specifically related to the testing performed on the die by the supplier or related to the quality of the die supplied.

5.2 Probing of bumped or TAB die

Recommendations for probe-testing bumped or TAB die, especially where the bump or TAB lead could be damaged by incorrect probing. This should also include information for repair of bumps damaged by probing.

5.3 Traceability

Information that links the individual die or batch to the manufacturer's traceability system. Traceability to an individual wafer within a wafer run may be necessary.

6 Specific recommendations - User or assembler related issues, techniques, best practice and material selection

6.1 General

This clause contains classes of information specifically of use to the user or assembler of flip-chip, including ACF-mounted die, or TAB die including recommended assembly techniques, best practice for assembly and information on material selection for assembly.

6.2 Bump material

Information on the bump material and construction including any under-bump metallisation (UBM).

6.3 Solder types

Suggested solder types that should be used to mount a flip-chip die, especially any specific recommendations to enable lead free soldering.

6.4 Distortion or dimensional tolerance of bumps

Information about dimensional tolerance and co-planarity of the bumps or distortion due to probing that may affect mounting of the flip-chip.

6.5 Fluxing required

Suggested flux material and techniques that should be used for flip-chip mounting using solder and suggestions for flux removal.

6.6 Adhesive and underfill

Information on adhesive and underfill that should be used when flip-chip mounting.

6.7 Encapsulation material

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Information on encapsulation material to protect the flip-chip assembly.

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6.8 Peak temperature and duration

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Maximum allowable die assembly process peak temperature and time for the bumped or TAB mounted die.

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6.9 TCE considerations

Information related to the thermal co-efficient of expansion (TCE) of the die material where the mounting method or substrate material selection may affect the performance of the die. This is particularly important for some silicon die and sensor MEMS where mechanical stress may adversely affect the electrical performance of the die.

6.10 Mounting limitations

Information on limits of mounting pressure, temperature and duration.

7 Specific recommendations – Handling, including pick & place issues, and storage

7.1 General

This clause contains classes of information specifically related to the handling and storage of die, in particular, issues related to pick & place and industry best practice on the handling and storage of die.

7.2 Backside fiducials

Information on specific features or alignment marks provided on the back of the flip-chip or face-down TAB die to enable optical pattern recognition systems to orient the die correctly and to provide for accurate placement of the die during assembly.

7.3 Die identity marking

Information on any mark or feature placed on the back of a flip-chip or face-down TAB die that enables identification of the die including, if provided, lot traceability information. This may be in the form of a code or 2D matrix, printed or etched on the reverse side of the die. The identity mark could also be a fiducial.

7.4 Unusual handling limitations

Information detailing maximum or minimum temperature, pressure, or acceleration excursions that should not be exceeded during handling or shipping the die. This is particularly important for some sensor MEMS which could be damaged if the maximum conditions are exceeded. This information should appear on the secondary packing.

7.5 Protection of connection structures

Information detailing recommended methods of protecting the connection structures of flip-chip or TAB die when handling and shipping e.g. recessed packing material to protect bumps.

7.6 Specific handling precautions when opening primary packing

Information detailing specific precautions or environment that should be used when opening primary packing containing product. This could be important where the die is a sensor or MEMS which is sensitive to a particular environment or where a particular method of shipment has been used e.g. a pressurised container for a pressure transducer containing a reference pressure within the device. This information should appear on both the primary and secondary packing.

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7.7 Orientation

Information on the orientation of the die in the primary packing.

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7.8 Storage

Information on the recommended storage conditions or information on the storage conditions to which the die has already been subjected. This is particularly important where the die should only be subjected to certain conditions for a limited period of time; either temperature, humidity, pressure or atmosphere.

8 Specific recommendations – Thermal, including modelling

8.1 General

This clause contains classes of information related to the intrinsic thermal characteristics of a die and the thermal performance of a die including any specific thermal modelling information specific to the use of the die.

8.2 Backside heat-sinking

Information on the requirements to remove heat from the back of the die for proper electrical performance of the die.

8.3 Thermal management of bumped die

Information about bumps provided on the die specifically to enable dissipation of heat to the substrate. These bumps may also provide electrical connection to the die.