
**Tankoplastna in hibridna integrirana vezja – 1. del: Osnovna specifikacija –
Postopek odobravanja zmogljivosti**

Film and hybrid integrated circuits – Part 1: Generic specification – Capability
approval procedure

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 165000-1:2006

[https://standards.iteh.ai/catalog/standards/sist/3edd4974-1647-4e07-9f70-
e02d970b42ae/sist-en-165000-1-2006](https://standards.iteh.ai/catalog/standards/sist/3edd4974-1647-4e07-9f70-e02d970b42ae/sist-en-165000-1-2006)

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

SIST EN 165000-1:2006

<https://standards.iteh.ai/catalog/standards/sist/3edd4974-1647-4e07-9f70-e02d970b42ae/sist-en-165000-1-2006>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 165000-1

April 1996

ICS 31.200

Descriptors: Quality, generic specification, hybrid circuits

English version
SIST EN 165000-1:2006
https://standards.iteh.ai/catalog/standards/sist/3edd4974-1647-4e07-9f70-e02d970b42ae/sist-en-165000-1-2006

Film and hybrid integrated circuits
Part 1: Generic specification
Capability approval procedure

This European Standard was approved by CENELEC on 1996-03-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Foreword

This European Standard was prepared by CLC/TC CECC SC 47AX (former CECC/WG 21), Film and hybrid integrated circuits.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 165000-1 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-03-01

The present standard, EN 165000-1, Film and hybrid integrated circuits - Part 1: Generic Specification - Capability approval procedure, is intended to be read in conjunction with the other parts of EN 165000, which are:

- Part 2: Internal visual inspection and special tests
- Part 3: Self-audit checklist and report for film and hybrid integrated circuit manufacturers
- Part 4: Customer information, product assessment level schedules and blank detail specification

Part 3 is primarily intended as a pro-forma for the manufacturer and is not considered essential for a customer in this form.

Part 4 is considered an essential document for all users; in particular it includes a helpful introductory section which is aimed at potential customers and seeks to explain the underlying philosophy upon which the whole standard is based.

CONTENTS

	Page
1. GENERAL	4
1.1 Scope	4
1.2 Normative references	4
1.3 Units, symbols and terminology	7
1.4 Standard and preferred values	9
1.5 Marking of circuit and package	9
2. QUALITY ASSESSMENT PROCEDURES	10
2.1 General	10
2.1.1 Eligibility for capability approval	10
2.1.2 Primary stage of manufacture	10
2.1.3 Subcontracting	10
2.1.4 Control of procurement sources and incoming material	11
2.1.5 Validity of release	11
2.1.6 Rework	12
2.2 Procedures for capability approval	13
2.2.1 Application for capability approval	13
2.2.2 Granting of capability approval	13
2.2.3 Description of capability	13
2.2.4 Capability qualifying components	14
2.2.5 Demonstration and verification of capability	15
2.2.6 Procedures to be followed in the event of CQC failure	19
2.2.7 Abstract of description of capability	19
2.3 Procedures following the granting of capability approval	19
2.3.1 Maintenance of capability approval	19
2.3.2 Modifications likely to affect the validity of capability approval	20
2.4 Release for delivery	21
2.4.1 General	21
2.4.2 Quality conformance inspection requirements	21
2.4.3 Detail specification	23
2.4.3(1) General	23
2.4.3(2) Customer detail specifications	23
2.4.3(3) Detail specification for standard catalogue items to be included in the Qualified Products List (QPL)	23
3. TEST AND MEASUREMENT PROCEDURES	23
3.1 General	23
3.2 Standard conditions for testing	24
3.3 Visual inspection and package dimensions	26
3.4 Electrical measurement procedures	26
3.5 Environmental test procedures	28-62
Figure 1 Definition of axis for mechanical and other tests	25
Figure 2 Pulling force for bond strength test	56
Figure 3 Apparatus requirements for the added component bond strength destructive test	62

1. GENERAL

1.1 Scope

This specification prescribes the quality assessment procedures and methods of tests to be used in the assessment of film and hybrid integrated circuits intended for use in electronic equipment, under the capability approval procedure. It also applies to part completed devices supplied to customers for subsequent processing.

It should be read in conjunction with EN 165000-2, -3 and -4.

1.2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 27		Letter symbols to be used in electrical technology	-	-
IEC 50		International Electrotechnical Vocabulary	-	-
IEC 68-1	1988	Environmental testing - Part 1 : General and guidance	EN 60068-1	1994
+ Corrigendum	1988		-	-
+ A1	1992		-	-
IEC 68-2-1	1990	Part 2 : Tests - Tests A : Cold	EN 60068-2-1	1993
A1	1993		A1	1993
A2	1994		A2	1994
IEC 68-2-2	1974	Tests B : Dry heat	EN 60068-2-2	1993
+ IEC 68-2-2A	1976		-	-
A1	1993		A1	1993
A2	1994		A2	1994
IEC 68-2-3	1969	Test Ca : Damp heat, steady state	HD 323.2.3 S2	1987
+ A1	1984		-	-
IEC 68-2-6	1995	Test Fc and guidance : Vibration (sinusoidal)	EN 60068-2-6	1995
+ Corrigendum	1995		-	-
IEC 68-2-7	1983	Test Ga and guidance : Acceleration, steady state	EN 60068-2-7	1993
+ A1	1986		-	-
IEC 68-2-11	1981	Test Ka : Salt mist	HD 323.2.11 S1	1988
IEC 68-2-14	1984	Test N : Change of temperature	HD 323-2-14 S2	1987
+ A1	1986		-	-

1.2 Normative references, continued

IEC 68-2-17	1994	Test Q : Sealing	EN 60068-2-17	1994
IEC 68-2-20	1979	Test T : Soldering	HD 323.2.20 S3	1988
+ A1	1986		-	-
+ A2	1987		-	-
IEC 68-2-21	1983	Test U : Robustness of terminations and integral mounting devices	HD 323.2.21 S3	1988
+ A1	1985		-	-
+ A2	1991		-	-
+ A3	1992		-	-
IEC 68-2-27	1987	Test Ea and guidance : Shock	EN 60068-2-27	1993
[IEC 68-2-28	1990	Guidance for damp heat tests	-	-]
IEC 68-2-30	1990	Test Db : Damp heat, cyclic	HD 323.2.30 S3	1988
+ A1	1985		-	-
[IEC 68-2-33	1971	Guidance on change of temperature tests	HD 323.2.33 S1	1988]
+ A1	1978		-	-
[IEC 68-2-44	1979	Guidance on Test T : Soldering	HD 323.2.44 S1	1988]
IEC 68-2-45	1980	Test XA and guidance : Immersion in cleaning solvents	EN 60068-2-45	1992
A1	1993		A1	1993
IEC 68-2-47	1982	Mounting of components, equipment and other articles for dynamic tests including shock (Ea), bump (Eb), vibration (Fc and FC), and steady-state acceleration (Ga) and guidance	EN 60068-2-47	1993
IEC 134	1961	Rating systems for electronic tubes and valves and analogue semiconductor devices	-	-
IEC 191		Mechanical standardization of semiconductor devices	-	-
IEC 440	1973	Method of measurement for non-linearity in resistors	-	-
IEC 617		Graphic symbols for diagrams	-	-
IEC 695-2-2	1991	Fire hazard testing - Part 2 : Test methods - Section 2 : Needle-flame test	EN 60695-2-2 + Corrigendum	1994 1994
IEC 747-1 ¹⁾	1983	Semiconductor devices. Discrete devices - Part 1 : General	-	-
+ A1	1991			
+ A2	1993			

1.2 Normative references, continued

IEC 748-1 ¹⁾	1984	Semiconductor devices. Integrated - circuits - Part 1 : General	-
IEC 749	1984	Semiconductor devices. Mechanical - and climatic test methods	-
+ A1	1991		
+ A2	1993		
CECC 00 007	Sampling plans and procedures for inspection by attributes		
CECC 00 114	Quality Assessment Procedures (RP 14)		
-	-	Part I : Approval of manufacturers and other organizations (with addendum) (RP 14/I)	EN 100114-1
CECC 00 114/III	Part III : Capability Approval of an electronic component manufacturing activity (RP 14/III)		
-	-	Radiographic inspection of electronic components	EN 100012
-	-	Protection of electrostatic sensitive devices	EN 100015
CECC 00 016	Basic requirements for the use of Statistical Process Control (SPC) in the CECC systems - Part 1 : Minimum requirements		
CECC 00 020	Register of firms, products and services approved under the CECC system		
CECC 00 300	List of CECC European Standards (ENs), CECC Publications and Related National Documents		
CECC 00 400 ²⁾	Handbook for the production of CECC documents		
ECQAC 1120 ³⁾	Harmonized system of quality assessment for electronic components. ECQAC requirements for the drafting of qualification approval and capability approval test reports		
ECQAC 1220 ³⁾	Harmonized system of quality assessment for electronic components. ECQAC policy or uncertainty of measurement		
ISO 1000	SI units and recommendations for use of their multiples and of certain other units		

- 1) Together with any other part of IEC 747 or IEC 748 relevant to the specific hybrid application, including terminology.
- 2) Superseded by the PNE-Rules (CEN/CENELEC internal regulations - Part 3 : Rules for the drafting and presentation of European Standards).
- 3) These documents were produced by the Electronic Components Quality Assurance Committee of the CECC and may be obtained from the ONS. ECQAC 1120 is to be incorporated into the revision of RP 14 Part II, currently under discussion; this will consist of two sections: Section 1 : Qualification approval of electronic components, and Section 2 : Release for delivery and validity of release. ECQAC 1220 will be incorporated into the revision RP 14 Part I, the voting for which is scheduled for completion in October 1995.

1.3 Units, symbols and terminology

1.3.1 General

Units, graphical symbols, letter symbols and terminology shall, wherever possible, be taken from the following documents:

ISO 1000 : SI units and recommendations for use of their multiples and of certain other units.

IEC 27 : Letter symbols to be used in electrical technology.

IEC 50 : International electrotechnical vocabulary.

IEC 617 : Graphical symbols for diagrams.

Any other units, symbols and terminology peculiar to one of the components covered by a generic specification, shall be taken from the relevant IEC or ISO documents listed under "Related documents", where not given below.

1.3.2 Terminology

In addition to the general requirements of 1.3.1, for the purposes of this generic and associated blank detail specifications the following definitions apply:

Added component - any component added to a hybrid film integrated circuit which is not formed on the surface of the substrate.

NOTE: Added components are incorporated components (see §1.3 of RP 14 Part III) excluding those formed on the substrate.

Burn-in - a non-destructive procedure designed to screen out early lifetime failures. Burn-in is an accelerated conditioning with a device under its operating electrical load at an elevated temperature, which is generally the maximum operating temperature that does not exceed the thermal rating of the device.

Capability Qualifying Component (CQC) - a test specimen used to assess, in part or in whole, a declared capability. It may be either a specially designed test specimen (process test vehicle) or a normal production circuit (qualification circuit), or a combination of both.

Category dissipation - that fraction of the rated dissipation defined in the detail specification, applicable at the Upper Category Temperature taking account of the derating curve prescribed (where appropriate) in the detail specification.

Custom built - a qualifying term for a circuit manufactured to a specific customer's requirements.

Electrical endurance - a procedure similar to burn-in but of extended duration. Electrical endurance may be considered destructive or non-destructive dependent upon duration and severity.

1.3.2 Terminology, continued

Embedding - a process using resins which can be hardened to produce a body embedding the circuit, for example:

- casting
- potting
- dip-coating
- transfer moulding

Film circuit element - a circuit element consisting of a film or films.

Film integrated circuit - an integrated circuit whose circuit elements, including the interconnections, are film elements formed on the surface of an insulating substrate.

Hybrid film integrated circuit - a film integrated circuit in which the main part of the circuit elements are produced in-situ as film circuit elements on a substrate, and which is completed by added components mounted on the substrate or elsewhere in the package.

Integrated circuit - a circuit in which the circuit elements are inseparably associated, such that, for the purpose of commerce and constructional design it is considered indivisible.

Lower category temperature (LCT) - the minimum ambient temperature at which a circuit has been designed to operate continuously.

Measurement uncertainty - a statement of the limits of the range within which the true value of the measurement is expected to lie in relation to the recorded result, with a defined confidence level.

Multilayer film circuit - a circuit of more than one layer of film interconnection, separated by at least one insulating film or gap.

Part-finished - a qualifying term for a film integrated circuit or hybrid film integrated circuit taken uncompleted from a production line. It cannot be completely assessed to the specification applicable in its normal finished state.

Package - total or partial envelope of an integrated circuit which provides:

- mechanical protection
- environmental protection
- outline dimensions

the package may also contain or provide terminals. It contributes to the thermal characteristics of the integrated circuit.

Process Test Vehicle (PTV) - a device or test structure used to verify, analyze or monitor processes or electrical/physical attributes.

Product Assessment Level Schedules (PALS) - the minimum circuit process and test requirements for the different market sectors/operating environments.

1.3.2 Terminology, continued

Qualification Circuit (QC) - a circuit which is representative of circuits manufactured to declared and identical processes and used for approval tests to one of the Product Assessment Level Schedules (PALS).

Repair - the making good of an approved circuit which has been damaged or has become defective after release. Circuits which have been repaired shall not be released under the CECC system.

Rework - any reprocessing or corrective processing operation carried out on a circuit before release to the customer.

Screening - examination or testing applied to all products in a lot for the purpose of detecting and removing potential failures.

Substrate - a piece of material forming a supporting base for film circuit elements and possibly added components.

Terminal - a specified externally available point of connection.

Thick film integrated circuit - a film integrated circuit whose films are produced by a printing process, serigraphy or other related techniques.

Thin film integrated circuit - a film integrated circuit whose films are produced by an accretion process such as vapour phase deposition or sputtering.

Upper category temperature (UCT) - the maximum ambient temperature at which a circuit has been designed to operate continuously at that portion of the rated dissipation which is indicated in the category dissipation.

1.4 Standard and preferred values

Where practical, values should be selected from the following:

- a) dimensions : IEC 191-2.
- b) temperatures in °C : 65, -55, -40, -25, -10, 0, +5, +25, +40, +55, +70, +85, +100, +125, +150

1.5 Marking

1.5.1 Circuit

The marking of the circuit shall be specified in the detail specification and provide adequate circuit identification and traceability. It shall include, in order of preference, as space permits:

- a) terminal identification (e.g. position of pin No.1);
- b) type designation;
- c) date code;
- d) factory identification code;
- e) handling precautions;
- f) mark of conformity;
- g) manufacturer's name or trade mark;
- h) serial number;
- i) product assessment level schedule (PALS) number.

1.5.2 Despatch primary pack

The marking of the despatch primary pack shall be specified in the detail specification and shall provide adequate contents identification and traceability. It should include, as relevant, information from 1.5.1 and the following:

- a) certificate of conformity reference number;
- b) order or contract number;
- c) quantity of circuits.

2. QUALITY ASSESSMENT PROCEDURES

2.1 General

2.1.1 Eligibility for capability approval

Capability approval may be granted only to a manufacturer of film integrated circuits and/or hybrid film integrated circuits who has been granted manufacturer's approval in accordance with the requirements of RP 14 Part I and also satisfies the requirements of §2.1 of RP 14 Part III.

A manufacturer is eligible for capability approval if direct supervision by the Chief Inspector, or in the case of subcontracted processes, the local Chief Inspector, is applied to the manufacturing process including the "primary stage" of manufacture.

2.1.2 Primary stage of manufacture

The production of the first film layer of a film integrated circuit on the surface of a substrate.

2.1.3 Subcontracting

Subcontracting shall be in accordance with the requirements of §2.2 of RP 14 Part III.

The subcontracted processes may be either:

- a) film production;
- b) trimming of elements;
- c) mounting of components;
- d) packaging.

Not more than two of the four named processes shall be subcontracted.

2.1.4 Control of Procurement Sources and Incoming Material

§2.3 of RP 14 Part III applies with the following details:

- (1) Added components, part finished components, materials and subcontracted processes covered by a CECC specification

These shall be procured using the normal CECC release procedures. Under these conditions no other assessment is required.

2.1.4 Control of Procurement Sources and Incoming Material, continued

(2) Added components, part finished components, materials and subcontracted processes not covered by a CECC specification

The chief inspector shall:

- a) ensure the existence of a procurement specification under his control;
- b) perform an evaluation programme for each procured item or family from all manufacturing sources in accordance with the relevant PALS for the finished circuit (see EN 165000-4).

This evaluation programme may be carried out as part of the initial design evaluation. Each variant shall be submitted to the minimum sample size and acceptance criteria in the appropriate PALS. Structural similarity principles may be used;

- c) define and institute a goods inward inspection and a continuous vendor rating system for all such items;
- d) instigate such other procedures that are necessary to ensure that procurement is equivalent to any relevant CECC release.

2.1.5 Validity of release for delivery

(1) General

Circuits may be released under Capability Approval subject to the following conditions:

- a) the circuits have been designed and manufactured within the manufacturer's approved capability;
- b) perform an evaluation programme for each procured item or family from all manufacturing sources in accordance with the relevant PALS for the finished circuit;
- c) the circuits, their added components, piece parts and materials are traceable to original manufacturer's lot numbers.

(2) Release of circuits subjected to destructive or non-destructive tests

Circuits subjected to destructive (D) mechanical or environmental tests shall not be included in the lot for delivery.

Circuits subjected to non-destructive (ND) tests may be delivered provided they meet the requirements of the detail specification.

(3) Delayed deliveries of circuits

Circuits held for a period exceeding 3 years following release of the lot shall be retested to the electrical and solderability tests of the detail specification, prior to delivery.

2.1.6 Rework

(1) General

Rework shall only be permitted within the procedures declared in the manufacturers approved capability manual as defined in §7.1 of RP 14 Part III.

A customer may prohibit or restrict rework on circuits to be supplied to a particular contract.

(2) General requirements

- a) where circuits have been directly embedded in hard plastic encapsulants, no rework is permitted other than that specified in 2.1.6 (8);
- b) maximum time/temperature excursions during rework shall be specified;
- c) screening, adequate to test the rework in accordance with the manufacturer's approved capability manual, shall be carried out after rework.

(3) Film conductors

Film conductors may be reworked by the attachment of conducting links provided that the number of links and methods of attachment comply with the requirements of the manufacturers approved capability manual.

(4) Wire bonds

Rebonding to semiconductor die shall be attempted only once and rebonding is restricted to not more than 10% of the wire bonds in a circuit. The rebonds shall be on at least 50% undisturbed metallization (excluding probe marks).

Rebonding to header pins and film conductor tracks is not restricted except that each rebond is on at least 50% undisturbed metallization.

(5) Compound wire bonds

The placing of one wire bond on top of another wire (compound wire bond) is permitted except on semiconductor die. The new bond shall cover at least 75% of the original bond, and shall be attempted only once.

(6) Added Components

Added components may be replaced up to 2 times except for eutectic bonded semiconductor die which may be replaced only once.

(7) Circuit Packages

Assembled substrates may be removed and placed into new packages only once.

Package lids may only be replaced if the design lid/circuit clearance is maintained.

Reworked packages shall be submitted to the screening sequence of the relevant PALS.

2.1.6 Rework, continued

(8) Other permitted rework

The following processes are also permitted:

- a) cleaning;
- b) marking;
- c) lead straightening.

(9) Use of reworked (removed) added components

Added components may be reused provided they conform with the requirements of the relevant visual, electrical, mechanical and environmental tests and the provisions of 2.1.5 (1) (c).

2.2 Procedures for capability approval

2.2.1 Application for capability approval

Application shall be made to the ONH in accordance with §2.4 of RP 14 Part III. In addition, the manufacturer shall:

- a) conform with the eligibility requirements of 2.1.1;
- b) carry out an audit and conform with the requirements of the Appraisal Checklist in EN 165000-3;
- c) submit the completed Appraisal Checklist to the ONS;
- d) conform with the requirements of one or more of the Product Assessment Level Schedules (PALS) in EN 165000-4. The testing shall be performed on a circuit type or types representative of the manufacturer's claimed production capability (see 2.2.4(3)).

2.2.2 Granting of capability approval

The manufacturer shall submit a report to the ONS covering the Capability Approval testing in accordance with the requirements of 2.2.5(3).

Capability approval shall be granted when the requirements of this specification have been satisfied.

2.2.3 Description of capability

The manufacturer shall declare his capability to the ONS in a capability manual.

The capability manual shall cover the requirements contained in Annex B of RP 14 Part III.

The area of capability of each QC shall be stated.