

Harmonized system of quality assessment for electronic components: Generic specification: Film and hybrid integrated circuits

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Components Standards Policy Committee (ECL/-) to Technical Committee ECL/24, upon which the following bodies were represented:

- British Broadcasting Corporation
- EEA — the Electronics and Business Equipment Association
- Electronic Components Industry Federation
- GAMBICA BEAMA Ltd.
- Ministry of Defence
- National Supervising Inspectorate
- Society of British Aerospace Companies Ltd.

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Telecommunications plc
- Royal Signals and Radar Establishment
- Telecommunication Engineering and Manufacturing Association

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Contents

	Page
Committees responsible	Inside front cover
National foreword	iii
Foreword	ii
Section 1. Scope	1
Section 2. General	
2.1 Order of precedence	2
2.2 Related documents	2
2.3 Units, symbols and terminology	3
2.4 Standard and preferred values	6
2.5 Marking	6
Section 3. Quality assessment procedures	
3.1 Primary stage of manufacture	7
3.2 Manufacturing stages and sub-contracting	7
3.3 Manufacturer's approval	7
3.4 Approval of Film and Hybrid Integrated Circuits (F&HICs)	7
3.5 Qualification approval	8
3.6 Capability approval	9
3.7 Certified test records	11
3.8 Delayed deliveries	12
3.9 Delivery of F&HICs subjected to destructive or non destructive tests	12
3.10 Supplementary procedure for deliveries	12
3.11 Supplementary information	12
Section 4. Test and measurement procedures	
4.1 General	13
4.2 Standard conditions for testing	13
4.3 Visual examination	14
4.4 Electrical measurement procedures	15
4.5 Environmental testing procedures	17
4.6 Screening	25
Annex A Internal visual examination	27
Figure 1	35
Figure 2	35
Figure 3	35
Figure 4	35
Figure 5	35
Figure 6	35
Figure 7	35
Figure 8	35
Figure 9	36
Figure 10	36
Figure 11	36
Figure 12	36
Figure 13	36
Figure 14	36
Figure 15	37
Figure 16	37
Figure 17	37

	Page
Figure 18	37
Figure 19	37
Figure 20	37
Figure 21	37
Figure 22	37
Figure 23	38
Figure 24	38
Figure 25	38
Figure 26	38
Figure 27	38
Figure 28	39
Figure 29	39
Figure 30	39
Figure 31	39
Figure 32	39
Figure 33	39
Figure 34	39
Figure 35	39
Figure 36	40
Figure 37	40
Figure 38	40
Figure 39	40
Figure 40	40
Figure 41	40
Figure 42	41
Figure 43	41
Figure 44	41
Figure 45	41
Figure 46	42
Figure 47	42
Figure 48	42
Figure 49	42
Figure 50	42
Figure 51	43
Figure 52	43
Figure 53	43
Figure 54	43
Figure 55	43
Figure 56	44
Figure 57	44
Figure 58	45
Figure 59 — Beam lead bond area	46
Figure 60 — Beam lead bond location	46
Publications referred to	Inside back cover

National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Policy Committee. It is identical with CENELEC Electronic Components Committee (CECC) 63000:1984 “*Harmonized system of quality assessment for electronic components. Generic specification: Film and hybrid integrated circuits*” as amended by amendments 1, 2, 3, 4 and 5, and supersedes BS CECC 63000:1985 which is withdrawn.

This standard defines quality assessment procedures and gives test and measurement conditions applicable to the entire family of film and hybrid integrated circuits.

Any sectional and blank detail specification dealing with a particular sub-family of film and hybrid integrated circuits required to be used in conjunction with this standard will select those tests which are considered appropriate to the sub-family and will also give more detailed information relative to the sub-family.

This standard is a harmonized specification within the CECC system. The existing non-harmonized British Standard which covers film and hybrid circuits is BS 9450 “*Specification for integrated electronic circuits and micro-assemblies of assessed Quality capability approval procedures: generic data methods of test*”.

This standard specifies the use of substances and/or test procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and in no way absolves either the supplier or the user from statutory obligations relating to health and safety at any stage of manufacture or use.

Details of national implementation of CECC standards are given in BS 9000-2 “*Specification for national implementation of CECC basic rules and rules of procedure*”.

Cross-references

International Standard	Corresponding British Standard
ISO 1000:1981	BS 5555:1981 <i>Specification for SI units and recommendations for the use of their multiples and of certain other units</i> (Identical)
	BS 2011 <i>Environmental testing</i>
* IEC 68-1:1982	* Part 1.1:1983 <i>General and guidance</i> (Identical)
IEC 68-2-1:1974 } 68-2-1A:1976 }	Part 2.1A:1977 <i>Tests A. Cold</i> (Identical)
IEC 68-2-2:1974 } 68-2-2A:1976 }	Part 2.1B:1977 <i>Tests B. Dry heat</i> (Identical)
IEC 68-2-3:1969	Part 2.1Ca:1977 <i>Test Ca. Damp heat, steady state</i> (Identical)
* IEC 68-2-6:1970	* Part 2.1Fc:1977 <i>Test Fc. Vibration (sinusoidal)</i> (Identical)
* IEC 68-2-7:1968	* Part 2.1Ga:1977 <i>Test Ga. Acceleration, steady state</i> (Identical)
* IEC 68-2-11:1964	* Part 2.1Ka:1977 <i>Test Ka. Salt mist</i> (Identical)
* IEC 68-2-14:1974	* Part 2.1N:1977 <i>Test N. Change of temperature</i> (Identical)
IEC 68-2-17:1978	Part 2.1Q:1981 <i>Test Q. Sealing</i> (Identical)

International Standard	Corresponding British Standard
IEC 68-2-21:1983	Part 2.1U:1984 <i>Test U. Robustness of terminations and integral mounting devices</i> (Identical)
*IEC 68-2-27:1972	*Part 2.1Ea:1977 <i>Test Ea. Shock</i> (Identical)
IEC 68-2-30:1980	Part 2.1Db:1981 <i>Test Db and guidance — Damp heat, cyclic (12 + 12 hour cycle)</i> (Identical)
IEC 68-2-45:1980	Part 2.1XA:1981 <i>Test XA and guidance. Immersion in cleaning solvents</i> (Identical)
IEC 68-3-1:1974	Part 3A & B:1977 <i>Tests A (cold) and tests B (dry heat)</i> (Identical)
IEC 695-2-2:1980	BS 6458 <i>Fire hazard testing for electrotechnical products</i> Section 2.2:1984 <i>Needle-flame test</i> (Identical)
CECC 00007:1973	BS E9007:1975 <i>Specification for harmonized system of quality assessment for electronic components: Basic specification: Sampling plans and procedures for inspection by attributes</i> (Identical)

NOTE The publications marked with an asterisk have been withdrawn. They have been superseded as follows:

IEC 68-1:1988	BS 2011-1.1:1989 (Identical)
IEC 68-2-6:1982	BS 2011-2.1Fc:1983 (Identical)
IEC 68-2-7:1983	BS 2011-2.1Ga:1984 (Identical)
IEC 68-2-11:1981	BS 2011-2.1Ka:1982 (Identical)
IEC 68-2-14:1984	BS 2011-2.1N:1985 (Identical)
IEC 68-2-27:1987	BS 2011-2.1Ea:1988 (Identical)

Reference should be made to the note to 2.2 on page 2.

The British Standard harmonized with CECC 00111 is BS 9000 “*General requirements for a system for electronic components of assessed quality*” — Part 1:1989 “*Specification of general procedures*”. IEC 117 substantially agrees in technical content with BS 3939 “*Guide for graphical symbols for electrical power, telecommunications and electronics diagrams*”.

The Technical Committee has reviewed the provisions of IEC 27, IEC 50, IEC 134, IEC 147-0 and IEC 191-2 to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

Related British Standards to IEC 27, IEC 50 and IEC 191-2 are BS 5775-11, BS 4727 and BS 3934 respectively.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, the CECC title page, page ii, pages 1 to 48, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Förderverein für Elektrotechnische Normung (FEN) e. V.
Cenelec Electronic Components Committee

CECC



Système Harmonisé d'Assurance de la Qualité
des Composants Electroniques

SPECIFICATION GNERIQUE:

**CIRCUITS INTEGRES
HYBRIDES
ET A COUCHES**

Harmonized System of Quality Assessment for
Electronic Components

GENERIC SPECIFICATION:

**FILM AND HYBRID
INTEGRATED CIRCUITS**

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik

FACHGRUNDSPEZIFIKATION:

**INTEGRIERTE HYBRID-
UND
SCHICHTSCHALTUNGEN**

1 Edition
Issue
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CECC 63000

1984

Foreword

The CENELEC Electronic Components Committee (CECC) is composed of those member countries of the European Committee for Electrotechnical Standardization (CENELEC) who wish to take part in a harmonized System for electronic components of assessed quality.

The object of the System is to facilitate international trade by the harmonization of the specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognized Mark, or Certificate, of Conformity. The components produced under the System are thereby accepted by all member countries without further testing.

This specification has been formally approved by the CECC, and has been prepared for those countries taking part in the System who wish to issue national harmonized specifications for FILM and HYBRID INTEGRATED CIRCUITS. It should be read in conjunction with the current regulations for the CECC System.

At the date of printing of this specification, the member countries of the CECC are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom, and copies of it can be obtained from the addresses shown on the blue flysheet.

Preface

This generic specification was prepared by CECC Working Group 21: “HYBRID MICRO-CIRCUITS”.

It is based, wherever possible, on the Publications of the International Electrotechnical Commission and in particular on IEC Publication 147: Essential ratings and characteristics of semiconductor devices and general principles of measuring methods.

The text of this generic specification was circulated to the CECC for voting in the documents listed below and was ratified by the President of the CECC for printing as a CECC Specification.

<u>Documents</u>	<u>Voting date</u>	<u>Report on the voting</u>
CECC (Secretariat) 1013	April 1981	CECC (Secretariat) 1074
CECC (Secretariat) 1178	August 1982	CECC (Secretariat) 1275
CECC (Secretariat) 1364	July 1983	CECC (Secretariat) 1411

Section 1. Scope

This specification applies to Film and Hybrid Integrated Circuits (F & HICs) — both passive and active as defined in IEC 147-0B: Second supplement to Publication 147-0.

This specification also applies to part-completed F&HICS supplied to customers for subsequent processing, and to chip carrier circuits having more than one chip, provided that they, as separate products, have been interconnected by film interconnection techniques. It is not intended to cover printed boards but is applicable to F&HICS which may include them.

It defines the quality assessment procedures and the methods for electrical, climatic and mechanical testing and states the requirements which shall be applied to the release of products using either qualification approval procedures or capability approval procedures, see **3.5** and **3.6** respectively.

Passive networks can be qualified to this specification or to alternative specifications, when introduced. For resistor networks, see specification CECC 64000.

Section 2. General

2.1 Order of precedence

Where any discrepancies occur for any reason, documents shall rank in the following order of precedence:

- the detail specification
- the sectional specification
- the generic specification
- the current regulations of the CECC System
- any other international, for example IEC documents, to which reference is made.

The same order of precedence shall apply to equivalent national documents.

2.2 Related documents

ISO 1000	(1973)	<i>SI units and recommendations for the use of their multiples and of certain other units.</i>
IEC 27-1	(1971)	<i>Letter symbols to be used in electrical technology: Part 1: General.</i>
IEC 50	—	<i>International Electrotechnical Vocabulary.</i>
IEC 68	—	<i>Basic environmental testing procedures.</i>
IEC 68-1	(1982)	<i>Part 1: General.</i>
IEC 68-2	—	<i>Part 2: Tests.</i>
IEC 68-2-1	(1974)	<i>Tests A: Cold.</i>
	(1976)	<i>Supplement A.</i>
IEC 68-2-2	(1974)	<i>Tests B: Dry heat.</i>
	(1976)	<i>Supplement A.</i>
IEC 68-2-3	(1969)	<i>Test Ca: Damp heat, steady state.</i>
IEC 68-2-6	(1970)	<i>Test Fc: Vibration (sinusoidal).</i>
	(1972)	<i>Amendment N° 1.</i>
IEC 68-2-7	(1968)	<i>Test Ga: Acceleration, steady state.</i>
IEC 68-2-11	(1964)	<i>Test Ka: Salt mist.</i>
IEC 68-2-14	(1974)	<i>Test N: Change of temperature.</i>
	(1978)	<i>Amendment N° 1.</i>
IEC 68-2-17	(1978)	<i>Test Q: Sealing.</i>
IEC 68-2-20	(1979)	<i>Test T: Soldering.</i>
IEC 68-2-21	(1983)	<i>Test U: Robustness of terminations and integral mounting devices.</i>
IEC 68-2-27	(1972)	<i>Test Ea: Shock.</i>
IEC 68-2-30	(1980)	<i>Test Db: Damp heat, cyclic (12 + 12 hour cycle).</i>
IEC 117	—	<i>Recommended graphical symbols.</i>
IEC 134	(1961)	<i>Rating systems for electronic tubes and valves and analogous semiconductor devices.</i>
IEC 147-0B	(1969)	<i>Essential ratings and characteristics of semiconductor devices and general principles of measuring methods.</i>
		<i>Part 0: General and terminology, second supplement.</i>
IEC 147-0D	(1974)	<i>Essential ratings and characteristics of semiconductor devices and general principles of measuring methods.</i>
		<i>Part 0: General and terminology, fourth supplement.</i>
IEC 147-1	(1972)	<i>Essential ratings and characteristics of semiconductor devices and general principles of measuring methods.</i>
		<i>Part 1: Essential ratings and characteristics</i>
IEC 148	(1969)	<i>Letter symbols for semiconductor devices and integrated microcircuits.</i>

IEC 148A	(1974)	<i>Letter symbols for semiconductor devices and integrated microcircuits</i> (Ch. X and XI).
IEC 191-1	(1966)	<i>Mechanical standardization of semiconductor devices.</i> Part 1: <i>Preparation of drawings of semiconductor devices.</i>
IEC 191-2	(1966)	<i>Mechanical standardization of semiconductor devices.</i> Part 2: <i>Dimensions.</i>
IEC 191-3	(1974)	<i>Mechanical standardization of semiconductor devices.</i> Part 3: <i>General rules for the preparation of outline drawings of integrated circuits.</i>
IEC 410	(1973)	<i>Sampling plans and procedures for inspection by attributes</i> (see CECC 00007).
IEC 440	(1973)	<i>Method of measurement of non-linearity in resistors.</i>
CECC 00100	(1974)	<i>Basic Rules.</i>
CECC 00107/I Issue 3	(1982)	<i>Quality assessment procedure for general usage.</i>
CECC 00107/III Issue 1	(1980)	<i>Quality assessment procedure for capability approval.</i>
CECC 00007	(1978)	<i>Basic Specification:</i> <i>Sampling plans and procedures for inspection by attributes.</i>

NOTE The above references apply to the current editions except for IEC 68 for which the referenced editions must be used.

2.3 Units, symbols and terminology

2.3.1 General

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

ISO 1000, *SI units and recommendations for the 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 117, *Recommended graphical symbols.*

The following clauses contain additional terminology applicable to F&HICs. A reference to the appropriate IEC document is given against each term.

Where further items are required they shall be derived in accordance with the principles of the documents listed above.

2.3.2 Microelectronics

(IEC 147-0B)

The concept of the construction and use of highly miniaturized electronic circuits.

2.3.3 Microcircuit

(IEC 147-0B)

A microelectronic device, having a high equivalent circuit element and/or component density, which is considered as a single unit.

NOTE A microcircuit may be a micro-assembly or an integrated (micro) circuit.

2.3.4 Integrated circuit

(IEC 147-0B)

A circuit in which a number of circuit elements are inseparably associated and electrically interconnected such that, for the purpose of specification, testing, commerce and maintenance, it is considered indivisible.

NOTE For this definition, a circuit element does not have an envelope or external connection and is not specified or sold as a separate item.

2.3.5 Integrated microcircuit

(IEC 147-0B)

A microcircuit in which a number of circuit elements are inseparably associated and electrically interconnected such that, for the purpose of specification and testing and commerce and maintenance, it is considered indivisible.

NOTE 1 For this definition, a circuit element does not have an envelope or external connection and is not specified or sold as a separate item.

NOTE 2 Where no misunderstanding is possible, the term “integrated microcircuit” may be abbreviated to “integrated circuit”.

NOTE 3 Further qualifying terms may be used to describe the technique used in the manufacture of a specific integrated microcircuit.

Examples of the use of qualifying terms:

- semiconductor monolithic integrated circuit;
- semiconductor multi-chip integrated circuit;
- thin film integrated circuit;
- thick film integrated circuit;
- hybrid integrated circuit.

2.3.6 Micro-assembly

(IEC 147-0B)

A microcircuit consisting of various components and/or integrated micro-circuits which are constructed separately and which can be tested before being assembled and packaged.

NOTE 1 For this definition, a component has external connections and possibly an envelope as well and it also can be specified and sold as a separate item.

NOTE 2 Further qualifying terms may be used to describe the form of the components and/or the assembly techniques used in the construction of a specific micro-assembly.

Examples of the use of qualifying terms:

- semiconductor multi-chip micro-assembly;
- discrete component micro-assembly.

2.3.7 Semiconductor integrated circuit

IEC 50(521-10-06)

An integrated circuit whose elements and interconnections are formed within and upon a semiconductor substrate.

2.3.8 Multichip microcircuit

Will be considered later.

2.3.9 Film integrated circuit

An integrated circuit whose interconnections and elements (if any) are films formed on an insulating substrate surface.

2.3.10 Hybrid integrated circuit

An integrated circuit formed by any combination of semiconductor and film integrated circuits or by the combination of any of these circuits with discrete elements.

2.3.11 Film hybrid integrated circuit

A film integrated circuit on which at least one component, encapsulated or unencapsulated, has been mounted.

2.3.12 Passive film hybrid integrated circuit

A film hybrid integrated circuit in which all the elements are passive.

2.3.13 Active film hybrid integrated circuit

A film hybrid integrated circuit in which at least one element is active.

2.3.14 Semiconductor chip hybrid integrated circuit

A film hybrid integrated circuit containing one or more unencapsulated semiconductor devices.

2.3.15 Substrate

A piece of material forming a supporting base for film circuit elements and/or added components.

2.3.16 Multilayer film circuit

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

2.3.17 Circuit element

An element, passive or active, of an integrated circuit that performs an electrical function.

2.3.18 Active element

An element primarily contributing electrical rectification, switching or gain to a circuit function.

NOTE Active elements may also be used to contribute resistance and capacitance to a circuit function, or to convert externally applied energy from one form to another.

Examples are diodes, transistors, semiconductor integrated circuits, light-sensing and light-emitting semiconductor devices.

2.3.19 Passive element

An element primarily contributing resistance, capacitance or inductance or a combination of these to a circuit function.

NOTE Examples are resistors, capacitors, inductors, filters, interconnecting tracks.

2.3.20 Thin-film integrated circuit

IEC 50 (521-10-08)

A film integrated circuit whose films are formed by vacuum deposition techniques, possibly supplemented by other deposition techniques.

2.3.21 Thick-film integrated circuit

IEC 50 (521-10-09)

A film integrated circuit whose films are formed by printing, serigraphy or other related techniques.

2.3.22 Vapour phase deposition technique

The deposition of conducting, insulating or semiconducting films onto solid substrates from a source material in the vapour phase by physical deposition or chemical reaction.

2.3.23 Screen printing technique

The deposition of conducting, insulating or semiconducting films onto solid substrates by pressing pastes (inks) through screens.

2.3.24 Plated film

Film obtained through chemical and/or electrochemical deposition.

2.3.25 Termination (Terminal)

Conductor (pin, tab, pad, etc ...) providing external electrical access to the integrated circuit.

2.3.26 Package

Total or partial envelope of an integrated circuit which provides:

- mechanical protection
- environmental protection
- outline dimensions.

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

2.3.27 Encapsulation

Encapsulation is the general process of surrounding the circuit or components with a protection medium against mechanical and physical/chemical stresses.

2.3.28 Protective coating

A layer of insulating material applied over the circuit elements for the purpose of mechanical protection and prevention of contamination.

2.3.29 Embedding

A process using resins which can be hardened to produce a body embedding the electronic assembly for example:

- casting
- potting
- dip-coating
- transfer moulding.

2.3.30 Process test vehicle

A specimen, not necessarily of a circuit but representative of at least one operation in the production line for the circuit to be qualified, and on which tests can be carried out to validate control of one or more processes.

2.3.31 Capability qualifying circuit (CQC)

A test specimen used to assess, in part or in whole, a declared capability. It may be either a specially designed test specimen or a normal production circuit, or a combination of both.

2.3.32 Part-completed component or F&HIC

A component or F&HIC taken uncompleted from its production line. It cannot be used for complete assessment to the specification applicable in its normal finished state.

2.3.33 Added component

A component which is connected mechanically and electrically to a substrate.

2.3.34 Screening

Examination or testing applied to all products in a lot.

2.3.35 Assessment level

Reflects the degree of assurance the purchaser has that the circuit meets the specification. It indicates the balance between lot by lot and periodic testing and severity of the inspection level and AQLs of the sampling plan.

2.3.36 Upper Category Temperature (UCT)

The maximum ambient temperature for which a component has been designed to operate continuously at that portion of the rated dissipation which is indicated in the Category Dissipation (2.3.8).

2.3.37 Lower Category Temperature (LCT)

The minimum ambient temperature for which a component has been designed to operate continuously.

2.3.38 Category Dissipation

Fraction of the rated dissipation exactly defined in the detail specification, applicable at the UCT taking account of the derating curve prescribed in the detail specification.

NOTE Category dissipation may be zero.

2.4 Standard and preferred values

Values should preferably be chosen from the following list:

- dimensions : IEC 191-2
- temperatures : preferred temperatures are: – 65, – 55, – 40, – 25, – 10,
+ 5, + 25, + 40, + 55, + 70,
+ 85, + 100, + 125, + 155 °C

2.5 Marking

2.5.1 The information given in the marking is selected from the following list, the relative importance of each item is indicated by its position in the list:

- 1) Terminal identification
(for example position of pin n° 1 where relevant)
- 2) Type designation
- 3) Date code
- 4) Factory identification code
- 5) Manufacturer's name or trade mark
- 6) Mark of conformity
(unless a certificate of conformity is used)
- 7) Special handling and safety precautions.

2.5.2 The F&HICS shall be clearly marked with 1), 2) and 3) above and with as many as possible of the remaining items as is considered necessary.

Any duplication of information in the marking on the F&HICS should be avoided.

2.5.3 The primary package containing the F&HICs shall be clearly marked with all the information listed in 2.5.1 with the reference of the detail specification followed by the letter defining the level of quality assessment (K, L or M) and, if applicable, by the letter identifying the screening sequence.

2.5.4 Any additional marking shall be so applied that no confusion can arise.

Section 3. Quality assessment procedures

3.1 Primary stage of manufacture

The primary stage of manufacture is the production of the first layer on the surface of a substrate.

3.2 Manufacturing stages and subcontracting

3.2.1 Manufacturing stages in a factory of an approved manufacturer in a non-CECC member country

- 1) F&HICs manufactured by an approved manufacturer in a factory of his company in a non-CECC member country can be delivered under the System only if the conditions of CECC 00107-I, § 2 and 7 are met.
- 2) The sectional specification shall indicate if, for technical reasons only, the principle of extension of manufacturers approval shall not be applied for a given sub-family or type of F&HIC.

3.2.2 Subcontracting of manufacturing processes

F&HICs that are partly manufactured in a factory other than that of the approved manufacturer can be delivered under the System only when the conditions of CECC 00107-1, § 2 and 7 are met.

The subcontracted processes may be either:

- the film production,
- or the trimming of elements,
- or the mounting of components,
- or the encapsulation.

Not more than two of these four named processes shall be subcontracted. Where the primary stage of manufacture is subcontracted, this shall be the only one allowed.

The responsibility for design of the film layout shall not be subcontracted.

When manufacturing processes are subcontracted, the following conditions apply:

- 1) The National Supervising Inspectorate (ONS) shall be satisfied that the Chief Inspector of the manufacturer of the F&HICs who is certifying the circuit under the CECC System has been provided with the full quality assessment and inspection documentation from the production facility in a non-CECC member country, and that he has the responsibility for inspection of the work and the inspection arrangements there. Such documentation shall include the inspection records for each sample of the product which undergoes inspection.
- 2) The Chief Inspector shall be provided with the production line process charts, the defined inspection points, the inspection requirements at each stage and the quality control requirements, together with the procedures for the transfer of the parts from the place of manufacture to the approved manufacturer who is certifying the component. The ONS shall be informed and have access to this documentation and be able to verify the application of these requirements.
- 3) Any changes in inspection requirements and manufacturing procedures shall be reported back to the Chief Inspector who is certifying the components. These changes shall be declared on the documentation accompanying the transferred parts. The significant changes shall be reported by the Chief Inspector to the ONS.
- 4) The Chief Inspector shall satisfy the ONS that the assessment of quality of the final products is not thereby reduced.

3.3 Manufacturer approval

To obtain manufacturing approval the manufacturer shall meet the requirements of CECC 00107 and shall state the technology for which he seeks approval.

3.4 Approval of film and hybrid integrated circuits

3.4.1 Approval procedures

To qualify a circuit, either as a custom-built or as a standard/catalogue item, either of the following two procedures may be used. These procedures conform to those stated in CECC 00107-I and CECC 0007-III.

To cover the different requirements of various electronics market sectors, three assessment levels (K, L, M) are specified for approval as prescribed in the sectional specification.

1) Qualification approval

The programme of tests for the appropriate assessment and severity level applies directly to the circuit to be qualified, as prescribed in **3.5** and the relevant sectional specification.

2) Capability approval

The product and CQCs are tested in combination and approval given to a manufacturing facility on the basis of validated design rules, processes and quality control procedures, as prescribed in **3.6** and the relevant sectional specification.

NOTE With capability approval, in addition to the testing of products, the manufacturer specifies in a capability manual his procedures for design, materials, processes and accepts monitoring of these by the ONS. Control is exercised by the combination of the lot-by-lot tests on all products released, together with periodic tests on capability qualifying circuits (CQCs) and if applicable, together with tests on process vehicles, to validate the capability on a routine basis.

Capability approval is usually convenient when structurally similar film and hybrid integrated circuits based on common design rules, are fabricated, in small or large quantities, by a group of common processes, even though they may have different electrical functions.

In the case of custom-built circuits, the customer and manufacturer will agree the detail specification.

3.4.2 Detail specifications

The detail specifications may introduce additional tests and/or tighter inspection plans than those given in the relevant sectional specification. They shall not, however, relax the requirements of the generic specification and the relevant sectional specifications.

The detail specification and certificate of conformity shall indicate whether the qualification approval procedure or the capability approval procedure has been used and which level of assessment has been applied.

3.5 Qualification approval

3.5.1 Granting of qualification approval

- 1) When using the first method of CECC 00107 — § 7.3, a circuit is qualified to a certain assessment level (K, L, M) after successful completion of the full programme of tests for initial qualification approval.
- 2) When using the second method of CECC 00107 — § 7.3, a circuit is qualified after successful completion of the full programme for lot-by-lot tests on three inspection lots and one lot for periodic inspection (quality conformance inspection).

3.5.2 Maintenance of qualification approval

- 1) Qualification approval is maintained after successful completion of the procedures and requirements of quality conformance inspection [see **3.5.1 2)**].
- 2) The manufacturer shall also have maintained continuous production for example:
 - there has been no change in the place of manufacture and final test
 - there has been no break exceeding 2 years in the manufacturer's declared periodic test schedule (Table 3).

3.5.3 Structural similarity

The grouping of structurally similar circuits for the purpose of initial qualification approval and quality conformance inspection shall be prescribed in the relevant sectional specification.

3.5.4 Materials, piece parts and components

Materials, piece parts and components other than those approved under the CECC System, may also be used provided the Chief Inspector is satisfied as to their conformance to the relevant specification and that the quality of the completed circuits shall not be reduced by their use. This is achieved by:

- the provision of adequate procurement documents
- and
- the application of adequate vendor assessment, control procedures and acceptance tests.

The ONS shall have access to the data on which the Chief Inspector has based his acceptance of these items.