
British Standard

Harmonized system of quality assessment for electronic components

Generic specification: Monolithic integrated circuits

Système harmonisé d'assurance de la qualité des composants électroniques
Spécification générique: Circuits intégrés monolithiques

Harmonisiertes Gütebestätigungssystem für Bauelemente der Elektronik
Fachgrundspezifikation: Monolithische Integrierte Schaltungen

National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Committee. It is identical with CENELEC Electronic Components Committee (CECC) 90000 : 1985 'Harmonized system of quality assessment for electronic components. Generic specification: Monolithic integrated circuits'. It supersedes BS CECC 90000 : 1982, which is withdrawn.

This standard gives the terminology, quality assessment procedures and test and measurement conditions applicable to the entire family of monolithic integrated circuits.

Any sectional and blank detail specification dealing with a particular sub-family of monolithic 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 BS 9400 'Integrated electronic circuits of assessed quality: Generic data and methods of test' will eventually be superseded by this standard for monolithic circuits only but for a period both standards will remain in force because of current approvals to BS 9400.

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.

This third issue of CECC 90000 results from amendments and additions which have been agreed since issue 2 was published in 1982.

Terminology and conventions. The text of the CECC specification has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used throughout as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Cross-references

International standards	Corresponding British Standards
ISO 1000-1981	BS 5555 : 1981 Specification for SI units and recommendations for the use of their multiples and of certain other units (Identical)
IEC 68	BS 2011 Basic environmental test procedures (The relevant parts are identical)
IEC 148 : 1969	BS 3363 : 1980 Letter symbols for semiconductor devices and integrated microcircuits (Identical)
CECC 00007 : 1973	BS E9007 : 1975 Harmonized system of quality assessment for electronic components. Basic specification: Sampling plans and procedures for inspection by attributes (Identical)

IEC 117 has now been superseded by IEC 617, the various Parts of which are identical with Parts of BS 3939 'Graphical symbols for electrical power, telecommunications and electronics diagrams'.

The British Standard harmonized with CECC 00100 is BS 9000 'General requirements for electronic components of assessed quality' Part 1 : 1981 'Specification of basic rules and rules of procedure'.

The Technical Committee has reviewed the provisions of IEC 27-1, IEC 50, IEC 134, IEC 147-0, IEC 147-1, IEC 147-2, IEC 147-5, IEC 191-1, IEC 191-2, IEC 191-3 and IEC 410 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 for IEC 50, IEC 191-1 and 191-2, and IEC 410 are BS 4727, BS 3934 and BS 6001, respectively.

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



Amendment No. 1
published and effective from 31 March 1987
to BS CECC 90000 : 1985

Harmonized system of quality assessment
for electronic components
Generic specification: Monolithic integrated circuits

NOTE. This Amendment implements the 1st Amendment to CECC 90000, Issue 3 (1985).
The national foreword has been amended accordingly.

Revised text

AMD 5374
March 1987

National foreword

In paragraph 6, insert the following second sentence.
'The 1st Amendment to CECC 90000, Issue 3 was implemented as Amendment No. 1 to
this British Standard.'

Instructions for the insertion of revised page

AMD 5374
March 1987

Delete pages 9 and 10 and insert revised page 9 and unchanged page 10.

Figure 2 applies for small packages. The lower part of the bottom side is available for manufacturer's additional marking.

The marking of cylindrical packages will be included later.

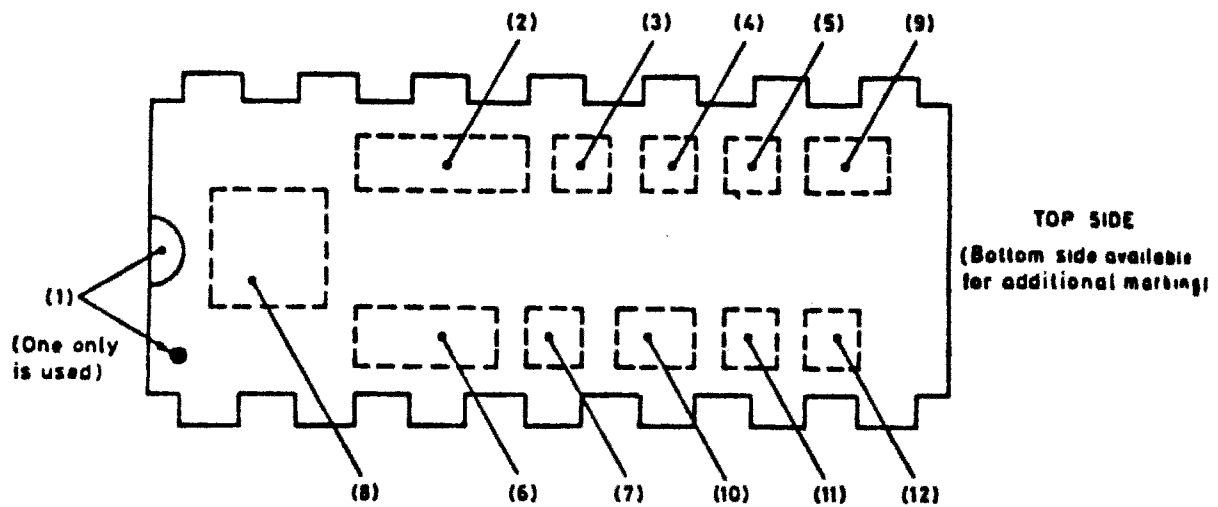


Figure 1

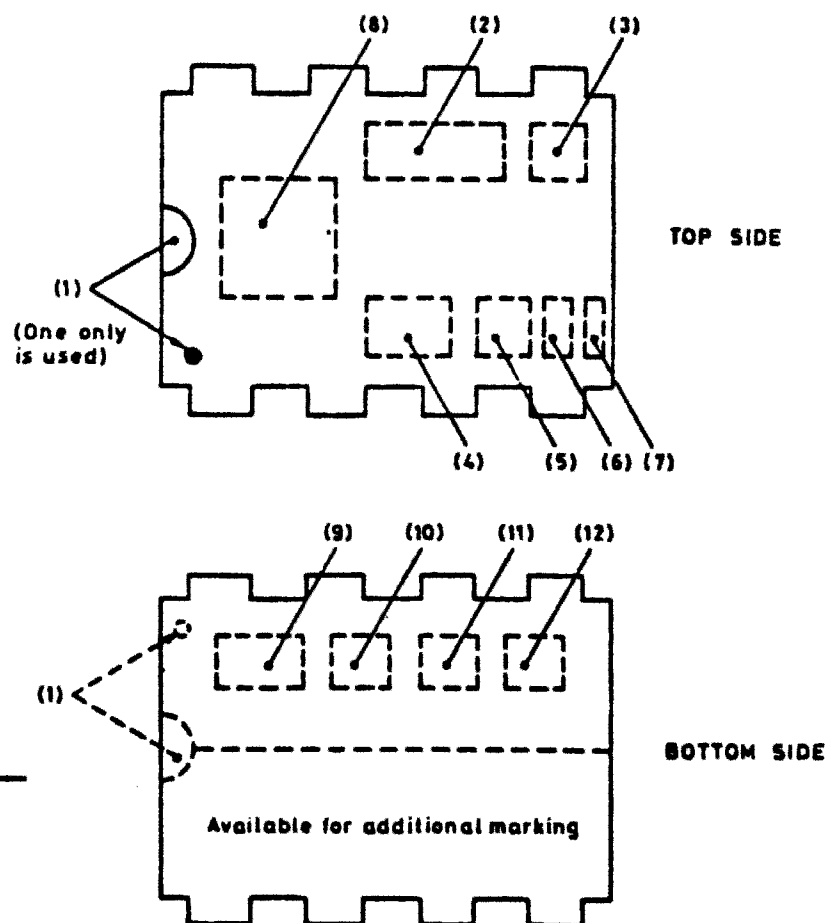


Figure 2

2.6 Ordering information

The following information shall be included in the order and also in the delivery documents. The package shall include sufficient information to relate to the delivery:

- (1) Manufacturer
- (2) Standardized or commercial type designation
- (3) Operating temperature range (if not included in (2), Pro-electron code may be used)
- (4) Required quality assessment level (in code)
- (5) Required optional test (salt mist for example), (in code, if applicable)
- (6) Required screening class (in code, if applicable)
- (7) Package shape (Pro-electron code may be used)
- (8) Package materials (Pro-electron code may be used)
- (9) Terminals metal and coating, (if applicable)
- (10) Relevant DS number and, if necessary, issue and date

Example: wording in the following order:

"N integrated circuits xxxx CD 4011B, C, R level with optional test 1, B Class, DG package, gold plated kovar terminals to CECC 90 104 - xxx, Issue 1 of 198 x".

means:

N integrated circuits manufactured by xxxx, type number CD 4011B, operating temperature range -55 °C to +125 °C, under quality assessment level R including optional test of salt mist, screened in B class, in glass sealed ceramic "dual in line" package, with gold plated kovar terminals, in compliance with DS CECC 90 104 - xxx, Issue 1 of 198 x.

3 - QUALITY ASSESSMENT PROCEDURES

3.1 Primary stage of manufacture and subcontracting

The primary stage for bipolar integrated circuits is the first process which changes the monocrystalline semiconductors material from being either wholly P-type or wholly N-type. The primary stage for MOS circuits is the first oxidation of the substrate.



Amendment No. 2
published and effective from 28 August 1987
to BS CECC 90000 : 1985

Harmonized system of quality assessment
for electronic components
Generic specification: Monolithic integrated circuits

NOTE. This Amendment implements the 2nd Amendment to CECC 90000, Issue 3 (1985).
The national foreword has been amended accordingly.

Revised text

AMD 5544
August 1987

National foreword (as amended by Amendment No. 1)
In paragraph 6, delete the second sentence and substitute the following.
'The 1st and 2nd Amendments to CECC 90000, Issue 3 were implemented as
Amendment Nos. 1 and 2 to this British Standard.'

AMD 5544
August 1987

Appendix B. Comparison between IEC and CECC documents concerning
environmental and endurance testing procedures
In the title and line 1, delete 'Appendix' and substitute 'Annex'.

Instructions for the insertion of new and revised pages

AMD 5544
August 1987

Delete pages 1 and 2 and insert revised pages 1 and 2.
Delete pages 15 and 16 and insert unchanged page 15 and revised page 16.
After page B6 insert new pages C1 to C27, D1 and E1.

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Specimens required for Group B, C and D inspection, shall be components which have passed Group A or Group B inspection for those characteristics of tests specified as post-test limits.

3.4.3 Sampling procedures for small lots

To be included later.

3.4.4 Supplementary procedure for reduced inspection

A special reduced inspection procedure for the tests in all Sub-Groups of Group B inspection may be used, provided that the conditions given for the change from normal to reduced inspection in IEC 410 are met.

Those tests in Group B which are already included as a periodic test in Group C, shall be under reduced inspection. Where no relevant test exists in Group C, the test shall be performed under Group B test conditions as an additional test with a fixed sample size giving 95 % confidence of accepting product of the Group B AQL (with acceptance on one defect).

This special procedure applies independently to each Sub-Group. It allows a manufacturer to carry out the appropriate Group B test at normal inspection under Group C conditions at intervals of three months instead of on a lot-by-lot basis.

Reversion to normal inspection for a Sub-Group in Group B shall be made when a Sub-Group has failed to meet Group C inspection.

3.4.5 Re-submission of rejected lots

Any lot rejected by Group A tests is returned to production for re-work or re-screening for the identified defect. No new parts are to be included in the lot.

The lot is then re-submitted and inspected under the conditions of tightened inspection. It shall retain the same lot number and details of the new submission shall be recorded. The same lot shall not be submitted more than three times.

For Group B tests the conditions for re-submission are under consideration.

3.4.6 Certified test records

The procedure given in CECC 00 109 shall apply, and the certified test records shall conform to the information given in the SS.

3.4.7 Delayed delivery

Released lots which have been in store for more than one year shall undergo and satisfy Group A and Sub-Group B2 tests before delivery. No further re-testing is needed for deliveries made within one year following a re-test.

ANNEX C

CAPABILITY APPROVAL

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ANNEX D CQC SPECIFICATION WRITER'S GUIDE (under consideration)

ANNEX E PROCESS IDENTIFICATION DOCUMENT GUIDE (under consideration)

C2.3 Capability boundaries

All electrical, physical and geometrical parameters applicable to design, manufacturing processes and finished products, as specified with absolute limits by the manufacturer in his relevant internal documentation, form the boundaries of the capability domain.

Those boundaries must be proved initially and thereafter periodically verified.

C2.4 Capability Manual

The Capability Manual (CM) includes a complete description of the capability, either directly or by reference to the manufacturer's internal documents, on:

- design rules
- manufacturing processes
- electrical performance limits, physical and geometrical limits
- verification procedures for design processes and products.

In particular reference shall be made to the Quality Manual (QM). The CM is mandatory and written by the manufacturer. Validation is performed by the ONS (National Supervising Inspectorate).

C2.5 Capability Manual abstract

An abstract of the CM shall be published and the ONS shall verify the compliance of it with the CM.

C2.6 Capability Qualifying Components

A Capability Qualifying Component (CQC) is a test specimen specially designed or taken from production of commercial products used for verifying capability (totally or partly) in accordance with the Capability Manual.

C2.7 Associated product

Associated product is a product manufactured within the boundaries of the Capability intended for delivery to customers. These products are listed in a Register of associated products.

- b) his inspection facilities and test laboratories are completely adequate for their purpose and are operated by staff with the necessary competence
- c) his measuring instruments are periodically checked by an approved calibration service
- d) his inspection organization is responsible directly to the management of the manufacturing company and is in particular, completely independent of anyone responsible for production. This organization and the procedure it uses shall be described in the Quality Manual. The manufacturer shall nominate one of the members of this organization who shall be called the Chief Inspector (see §3 of CECC 00 107 Part I for the definition of the Chief Inspector)
- e) his system of storage and delivery organized in agreement with the Chief Inspector, makes it possible to separate clearly and to identify the rejected lots, the lots undergoing tests and the lots which are released, and to relate the delivery lots to the inspection lots from which they are taken. For this purpose, the results of tests made on these inspection lots shall be kept for at least two years.

C3.2 Manufacturer's application for Capability Approval

The manufacturer shall apply in writing to the body designated in the national rules stating the domain and the boundaries of the proposed capability approval.

C3.3 Capability Manual Preparation

The manufacturer shall prepare the Capability Manual in accordance with C7.

C3.4 Initial Audit

An audit shall be carried out by the ONS in accordance with C9 to verify all claims of the manufacturer, including the procedure of C3.1.

C4. CAPABILITY APPROVAL MAINTENANCE PROCEDURE

To maintain the approval a manufacturer shall comply with the following conditions to the satisfaction of the ONS

- 1) He shall retain evidence that the capability boundaries stay valid, by periodically testing the CQCs in accordance with the capability test programme, see C8
- 2) The results of the audits by the ONS at intervals not greater than one year shall be satisfactory, see C9
- 3) The delivered products shall fulfill the quality assurance requirements as defined in C10
- 4) The Capability Manual shall be continuously updated concerning all implemented changes
- 5) The Detail Specification Register of associated products to be supplied under capability approval shall be valid.

C5. PROCEDURE FOR REDUCTION, EXTENSION OR CHANGE OF CAPABILITY

Where an approved manufacturer wishes to reduce, extend or change the domain of his capability it is the responsibility of the Chief Inspector to decide whether the reduction, extension or change is significant or not.

A significant change is a change which affects the quality or the reliability of associated products or the capability boundaries.

Where the reduction, extension or change is not significant it shall be recorded by the manufacturer and referred to in the capability manual. In this case the manufacturer may proceed without the approval of the ONS.

C7. CAPABILITY MANUAL

The Capability manual (CM) is the property of the manufacturer and the document management is the responsibility of his Chief Inspector.

The ONS has a copy of the CM and access to its referenced documents, all of which shall be regarded as highly confidential information. He shall regularly review and ratify any changes to these documents.

C7.1 Organization of the Capability Manual

The CM shall contain the following sections, with contents as given in the paragraphs of C7.2.

Section 1 - List of revisions

Section 2 - Quality arrangements (Quality Manual)

Section 3 - Capability domain, capability boundaries and their related CQCs

Section 4 - Flow charts, including process parameters

Section 5 - Purchased materials

Section 6 - Packages

Section 7 - Design rules

Section 8 - Customer interests

Section 9 - Register of associated products

In addition the front page shall give the manufacturer's name and reference number, the issue number and issue date, the revision number and revision date of the CM. This page will be authorized by the Chief Inspector and by the ONS.

C7.2 Contents of the Capability Manual

C7.2.1 Section 1 - List of revisions

The validation of the updating of the CM is part of the audit procedure, see C9.

Revisions shall be identified by a number and date.

C7.2.3 Section 3 - Capability domain, capability boundaries and their related CQCs

This section shall give the identification of the domain of the capability in terms of:

- the semiconductor technology
- the packages available
- the main assembly techniques
- the manufacturer's internal screening methods
- the place of manufacture plus sub-contracting procedures and controls if appropriate (see 3.1 of CECC 90 000, Issue 3)

This section shall also give a complete cross reference list of the capability boundaries and the CQCs chosen to assess the boundaries, see C8.1.

C7.2.4 Section 4 - Flow charts, including process parameters

This section shall include detailed flow charts giving the full sequence of events in the manufacturing process and giving the procurement specifications, process specifications, working instructions, inspection and quality control checks, generally by reference to in-house documentation. All documents shall specify the process parameters used for process control purposes.

The following generally recognized stages of manufacture shall be covered:

- design verification
- mask manufacture
- substate preparation
- diffusion, including photolithographic process
- pretesting
- scribing, dicing, sorting
- die attachment
- lead attachment
- encapsulation
- finishing and marking
- final testing

It is recommended to use the following format:

TYPE FUNCTION PACKAGE DS-No ISSUE No VALIDATION DATE

C8. CAPABILITY TEST PROGRAMME

C8.1 Capability Qualifying Component (CQC)

CQCs are used in the qualification test programme to obtain capability approval and for the maintenance of capability approval through periodic tests, see C8.2.

For Qualification the tests shall demonstrate all the boundaries of the capability.

For maintenance the tests shall demonstrate either all the boundaries of the capability or, the boundaries used for the products delivered during the last period.

As a CQC two types of component may be used:

- type I : A component specially designed and manufactured to assess the design rules and the manufacturing process.
- type II : Commercial product taken from production.

Generally it is not possible to cover all boundaries of the capability with a single CQC. Either a single type or a combination of both types may be used and together they shall be adequate to assess the complete design rules, the materials and the manufacturing processes. Where it is claimed that a diffused/metallized element, or group of elements, can demonstrate one or more boundaries, such element or group of elements shall be measurable separately without influence from other circuit elements.

Any information collected during routine process control may be used.

It is permissible for periodic tests to use different CQCs within the sample for a given test sequence provided that it can be demonstrated to the satisfaction of the ONS that these CQCs are equivalent with respect to the test results.

The manufacturer is responsible for all testing, including sub-contract testing. Any sub-contracted testing shall be carried out in a CECC approved test house.

In case of failure of a periodic test §15 of CECC 00 107 Part I applies.

If the capability approval is required for Diffusion only, then the E-, F- and G- tests in C 8.3 do not apply.

NOTE: For LTPD Tables see: ISO/DIS/7362 "Attribute sampling plans indexed by nominal Limiting Quality (LQ)".

TEST SEQUENCE*	D ND	CONDITIONS OF TEST*	LIMITS TO BE SPECIFIED	INSPECTION REQUIREMENTS	
QUALIFICATION TESTS/PERIODIC TESTS FOR CAPABILITY APPROVAL				ASSESSMENT LEVEL	
				LTPD	ACCEPT NUMBER Note 1
followed by: Damp heat, steady state End point tests: Electrical tests: Sub-groups A2 and A3 S/4.1.1, S/4.1.2 and S/5.5 Note 2 External visual examination G/4.2.2		G/4.6.2(2) severity 1 21 days As for sub-groups A2 and A3 G/4.2.2.	As for sub-groups A2 and A3		
F-Tests Note 3 Resistance to soldering heat followed by: Change of temperature followed by: Damp heat, cyclic followed by: Sealing followed by: End point tests: Electrical tests: Sub-groups A2 and A3 S/4.1.1, S/4.1.2 and S/5.5 Note 2 External visual examination G/4.2.2	D	G/4.6.11 G/4.6.8(3) Test Nc or G/4.6.8(1) Test Na 10 cycles G/4.6.3(2) Test Db G/4.6.9(1) Test Qk and G/4.6.9(2) Test Qc As for sub-groups A2 and A3 G/4.2.2	As for sub-groups A2 and A3	15	3 max.
G1-Tests Dimensions followed by: Solderability G/4.6.10 followed by: Immersion in cleaning solvents G/4.4	D	G/4.3 G/4.6.10(1) or G/4.5.10(2) Ageing required if specified by the CQC-DS IEC 68-2-45 Test XA	S/5.3.1	20	3 max.

* Clause numbers refer to G=CECC 90000 Issue 3, S=CECC 90100 Issue 2
 Notes : See page C21.

Notes

- 1 - The LTPD sampling plan (90 % confidence) shall permit an acceptance number of 0, 1, 2 or 3 and shall be determined by the manufacturer.
- 2 - Clause numbers are for digital circuits. For other circuits the appropriate clauses of the relevant Sectional Specification apply.
- 3 - E-Tests and I1-Tests for non-cavity packages only, F-Tests and I2-Tests for cavity packages only.
- 4 - The order of this sequence is not mandatory.

C9. VERIFICATION OF CAPABILITY (AUDIT)

To ensure that the manufacturer's organization, processes and products are correctly documented in his capability manual and effectively implemented in accordance with the requirements, a regular audit shall be performed by the ONS and for which the ONS has the responsibility. The ONS may call on expert advice, in particular areas. Such experts shall be acceptable to the manufacturer.

C9.1 Audit

The ONS shall verify the following:

1) Capability manual

Conformance of the CM to C7, the updating of the CM, the stated capability boundaries and the related CQCs, the Register of associated products, the process changes and supporting data.

2) Quality assessment

Conformance of Group A and B test programmes, the periodic test programme on CQCs, and the test results with the requirements of this document.

Special attention shall be given to in-line inspection and process control data related to stated boundaries.

9) Change Control

That a procedure has been established to ensure that any change affecting capability has been efficiently executed and documented.

10) Traceability

That the procedure for lot traceability is established and effectively implemented.

C9.2 Experts' responsibilities

If the ONS needs technical advice in any particular area he may call on the services of an expert. The expert shall be knowledgeable in design, technology and failure mode, measurements and testing.

The expert shall write a report on all aspects of his survey. After agreement between the expert and the Chief Inspector on the contents of the report it shall be submitted to the ONS to be taken into account in his final decision on the audit.

For major deficiencies a corrective action plan shall be agreed, with a timescale for completion.

The efficiency of the corrective action shall be verified by a subsequent audit.

C10. QUALITY ASSURANCE OF PRODUCTS DELIVERED UNDER CAPABILITY APPROVAL

The general requirements of CECC 90 000, Issue 3 #2 are applicable unless otherwise specified.

C10.1 Quality assurance responsibility

The manufacturer is responsible for guaranteeing the conformance of the delivered product to its specification.

C10.6 Correlated measurements in Group A tests

Measurements of static and dynamic characteristics in Group A tests at extreme temperatures may be performed at room temperature, if permitted by the appropriate assessment level, and if it can be demonstrated to the satisfaction of the ONS that the test results under the two conditions (room temperature with respect to extreme temperature) are correlated. The requirements for such a correlation are given in CECC 90 000 Clause (under consideration).

If correlated measurements have been used the measurements at extreme temperatures shall be performed on CQCs on a periodic basis, see C8.2.

C11. MARKING AND ORDERING INFORMATION

The marking and the ordering information shall be in accordance with the requirements of §§2.5 and 2.6 of CECC 90 000, Issue 3.

In respect of §§2.5(4) and 2.6(4) the code for products supplied under Capability Approval shall have the letter Z after the letter indicating the assessment level.

C12. CAPABILITY MANUAL ABSTRACT FOR PUBLICATION PURPOSES

For publication in the CECC Qualified Products List, an abstract of the CM shall be written which includes all capability boundaries not considered confidential by the manufacturer.

EXAMPLE:

CECC reference	CECC 90 000, Issue X, Category.....
Certificate Number	007 Issue 1, dated.....
Manufacturer	M.B.S. Int. Circuits Ltd., Silicon Street, Planar, OP1 1KHJ Tel. 096 876542

Note: The ownership rights may be vested in the customer and/or manufacturer, and the contents may be held confidential by both.

C14. STANDARD CATALOGUE ITEMS DETAIL SPECIFICATIONS

When a component covered by the capability approval procedure is intended to be offered as a standard catalogue item, a detail specification complying with the relevant BDS, Family Specification or Function Specification shall be written. Such specifications shall be registered by the CECC and the component may be listed in CECC 00 200: Qualified Products List.

C15. DETAIL SPECIFICATION REGISTER

The manufacturer shall maintain a register of detail specifications, of all products released under the capability approval procedure. This register shall be available to the ONS.

C16. HANDLING

Packing for delivery shall indicate the sensitivity of devices to static discharge, shall display adequate warnings, shall permit verification of the identity of the devices without opening, and shall contain adequate protection for terminals, e.g. conducting tubes, conducting foam or conducting rings.

ANNEX D

CQC SPECIFICATION WRITER'S GUIDE

(under consideration)

ANNEX E

PROCESS IDENTIFICATION DOCUMENT GUIDE

(under consideration)



Amendment No. 3
published and effective from 28 February 1990
to BS CECC 90000 : 1985

Harmonized system of quality assessment
for electronic components
Generic specification: Monolithic integrated circuits

NOTE. This Amendment implements the 3rd Amendment to CECC 90000, Issue 3 (1985). The national foreword has been amended accordingly.

Revised text

AMD 5922
February 1990

National foreword (as amended by Amendment No. 2)

In paragraph 6, delete the second sentence and substitute the following.

'The 1st, 2nd and 3rd Amendments to CECC 90000 Issue 3 were implemented as Amendment Nos. 1, 2 and 3 to this British Standard.'

Instructions for the insertion of new and revised pages

AMD 5922
February 1990

Delete pages 1 and 2 and insert revised pages 1 and 2.

Delete pages 7 and 8 and insert unchanged page 7 and revised page 8.

Delete pages 11 and 12 and insert revised pages 11 and 12.

Delete pages 15 and 16 and insert revised page 15 and new page 15A and unchanged page 16 (backed with blank page 15B).

Delete pages 21 and 22 and insert revised page 21 and new page 21A, new page 21B and revised page 22.

Delete pages 23 and 24 and insert revised pages 23 and 24.

After page 24 insert new pages 24A and 24B.

Delete pages 29 and 30, 31 and 32, 33 and 34 and 35 and 36, and insert revised pages 29 and 30, 31 and 32, 33 and 34 and unchanged page 35 and revised page 36.

After page 36 insert new pages 36A and 36B, 36C and 36D and 36E and 36F.

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