

**Harmonized system of quality
assessment for electronic components**

**Basic specification:
Microwave common
modules for use up
to 20 GHz —
Interfaces, fixings,
connection protocol
and module coding**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electrotechnical Sector Board to Subcommittee ECL/-/11, upon which the following bodies were represented:

- Association of Contract Electronics Manufacturers (ACEM)
- Federation of the Electronics Industry
- Ministry of Defence
- National Supervising Inspectorate (BSI QA)

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	iv
Text of CECC 00017	1
List of references	Inside back cover

National foreword

This British Standard has been prepared under the direction of the Electrotechnical Sector Board. It is identical with CENELEC Electronic Components Committee (CECC) 00017:1994 *Harmonized system of quality assessment for electronic components basic specification: Microwave common modules for use up to 20 GHz — Interfaces, fixings, connection protocol and module coding*.

This standard provides guidance on the method of coding microwave common modules (MiCM), using configurations which are optimized for use up to 20 GHz. The design procedures detailed in this specification are to be used in conjunction with process assessment schedule¹⁾ CECC 200013, and the generic specification BS EN 160000 (including the applicable sectional and blank detail specification), as appropriate to specific products using MiCMs.

Cross-references

International Standard	Corresponding British Standard
EN 100015	BS EN 100015 <i>Harmonized system of quality assessment for electronic components. Basic specification: protection of electrostatic sensitive devices</i> Part 1:1992 <i>General requirements</i> (Identical)
EN 160000	BS EN 160000:1993 <i>Harmonized system of quality assessment for electronic components. Generic specification: modular electronic units</i> (Identical)
IEC 50(581)	BS 4727 <i>Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms</i> . Part 1 <i>Terms common to power, telecommunications and electronics</i> Group 13:1991 <i>Electromechanical components for electronic equipment</i> (Identical)
IEC 68	BS 2011 <i>Environmental testing</i> (Most Parts identical or technically equivalent)

The Technical Committee has reviewed the provisions of IEC 27 to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. There is no corresponding British Standard to IEC 27.

The British Standard which implements the CECC Rules of Procedure is BS 9000 *General requirements for a system for electronic components of assessed quality* Part 2:1991 *Specification for national implementation of the CECC system*.

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 and ii, the CECC title page, pages ii to iv, pages 1 to 26, 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.

¹⁾ CECC 200013 *Hybrid Microwave Integrated Circuits Process Assessment Schedule* has not yet been published. When published it is not intended to adopt it as an identical British Standard.

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

CECC

Système Harmonisé d'Assurance de la Qualité
des Composants Electroniques

SPECIFICATION DE BASE:

**MODULES HYPERFREQUENCES
UTILISES JUSQU'A 20 GHz**

**INTERFACES, FIXATIONS, CONNEXIONS,
PROTOCOLE ET CODAGE DES MODULES**

Harmonized System of Quality Assessment for
Electronic Components

BASIC SPECIFICATION:

**MICROWAVE COMMON MODULES
FOR USE UP TO 20 GHz**

**INTERFACES, FIXINGS, CONNECTION
PROTOCOL AND MODULE CODING**

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik

GRUNDSPEZIFIKATION:

**ALLGEMEINE MIKROWELLEN-
MODULE BIS 20 GHz**

**SCHNITTSTELLEN, BEFESTIGUNGEN,
ANSCHLUSSPROTOKOLL UND CODIERUNG
DER MODULE**



1

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Contents

	Page
Foreword	iv
1 Introduction	1
2 General	1
2.1 Scope	1
2.2 Health & Safety	1
2.3 Related Documents	1
2.4 Terminology	1
3 Mechanical interface and fixing	1
3.1 Module Coding Fields	1
3.2 Module Interfaces	3
3.3 Mechanical Specification	3
3.4 Module Profile	4
3.5 Identifier, Interconnections and Fixing Protocols	4
4 Preferred characteristics for customer detail specification	5
4.1 Dimensions, Fixings and RF Connections	5
4.2 RF & DC Connections and Interface VSWR	5
4.3 Specification of Modules	6
5 Marking	6
6 Packaging	6
7 Environmental testing	7
Annex A MiCM20 Coding	8
Annex B Preferred Module Short Code Options	9
Annex C MiCM20 Basic Nomenclature: Flanged Carrier Shown	10
Annex D MiCM20 Dimensions, Tolerances and Configuration	11
Annex E Example of Customer Detail Specification for MiCM20	26
Figure 1 — MiCM20 Dimensions and Tolerances, (showing various Module Sizes and Configurations)	11
Figure 2 — MiCM20 Dimensions and Tolerances, (showing various Module Sizes and Configurations)	12
Figure 3 — MiCM20 Dimensions and Tolerances, (showing various Module Sizes and Configurations)	13
Figure 4 — MiCM20 Dimensions and Tolerances, (showing various Module Sizes and Configurations)	14
Figure 5 — Example of Module using Composite and Partial Substrates	15
Figure 6 — Flanged Carrier showing Minimum Projection of Substrate above Carrier	15
Figure 7 — Permitted Component Area and Recommended Maximum Component Height	16
Figure 8 — Interconnections Numbering Scheme, (showing various Module Sizes and Configurations)	17
Figure 9 — Interconnections Numbering Scheme, (showing various Module Sizes and Configurations)	18
Figure 10 — Interconnections Numbering Scheme, (showing various Module Sizes and Configurations)	18
Figure 11 — Interconnections Numbering Scheme, (showing various Module Sizes and Configurations)	19
Figure 12 — Interconnections Numbering Scheme, (showing various Module Sizes and Configurations)	20
Figure 13 — Interconnections Numbering Scheme, (showing various Module Sizes and Configurations)	21
Figure 14 — Interconnection Options for Modules with Dissimilar Widths	22
Figure 15 — Alternative Preferred DC and Control Port Position	23

	Page
Figure 16 — Preferred Alternative DC and Control Port Positions: Example Showing Use in Receiver System	24
Figure 17 — Carrier Boss Positions	25

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 acceptable in all member countries without further testing.

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 fly sheet.

Preface

This basic specification was prepared by the UK Microwave Common Module (MiCM) Industry Group for the CECC MUAHAG European Military Usage and Harmonization Advisory Group.

The text of this specification was circulated to the CECC for voting in the documents listed below under the Single Operating Procedure, and was approved for publication.

<u>Documents</u>	<u>Dates of Voting</u>	<u>Reports on the Voting</u>
CECC MUAHAG (Sec) 382	September 1992	CECC/CD (Sec/OSLO) 4

Secretariat Note:

This basic specification is issued initially in English and German only. A corresponding version in French will follow on request of the ONHs.

1 Introduction

Microwave Common Modules (MiCM) are a family of rectangular microwave functional modules having standardized microstrip interfaces and fixings. Each module comprises a metal or metallised carrier upon which is mounted active and/or passive microwave circuits, with each interconnection to an external module or circuit consisting of a dielectric substrate which carries a suitable microstrip or electrically conductive metallic pattern.

A MiCM may be one or more of the basic building blocks of a microwave system eg. amplifier, oscillator, switch, coupler, mixer, etc., but the interfaces and fixings will be defined such that each module can be specified by means of a code to ensure mechanical and electrical compatibility with any adjacent module.

There are no constraints on the function(s), circuit design technology, housing and applications. This specification will ensure that all MiCMs using identical Short Codes will be electrically compatible by having common substrate parameters and module thickness and that appropriate specification of the full. Type Coding will facilitate compatibility of RF connections. (See clause 3.1).

2 General

2.1 Scope

This specification provides guidance on the method of coding MiCMs, using configurations which are optimised for use up to 20 GHz. It defines dimensions and interfaces, together with the size and positions of interconnecting pads and fixings; these Microwave Common Modules are referred to as MiCM20 in this specification.

The design procedures detailed in this specification shall be used in conjunction with Process Assessment Schedule (PAS) CECC 200013, and the Generic Specification EN 160000 (including the applicable sectional and blank detail specification), as appropriate to specific products using MiCMs. These products may be either complete deliverable functional units, or defined parts of units.

2.2 Health and Safety (warning)

This specification calls for the use of substances and/or 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 designer, the producer, the supplier or the user from statutory obligations relating to health and safety at any stage of manufacture or use.

2.3 Related Documents

Reference in this specification to any related documents means the current edition and all amendments unless use of a specific edition is required.

2.3.1 IEC

IEC 27, *Letter Symbols to be used in Electrical Technology*.

IEC 50 (581), *International Electrotechnical Vocabulary: Electromechanical Components for Electronic Equipment*.

IEC 117, *Recommended graphical symbols*.

IEC 68, *Environmental Testing*.

2.3.2 CECC

CECC 00015, *Protection of electrostatic sensitive devices — Part 1: minimum requirements*.

CECC 200013, *Hybrid Microwave Integrated Circuits — Process Assessment Schedule*. (Not yet published)

EN 160000, *Generic Specification for modular electronic units*.

2.4 Terminology

2.4.1 General

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

IEC 27, *Letter symbols to be used in electrical technology*.

IEC 50 (581), *International Electrotechnical Vocabulary: Electromechanical Components for Electronic Equipment*.

IEC 117, *Recommended graphical symbols*.

3 Mechanical interface and fixing

3.1 Module Coding Fields

Microwave Common Modules are a family of rectangular microwave functional modules having standardised microstrip interfaces and fixings.

The MiCM20 Type Code comprises ten parameter fields. The first four form the MiCM20 Short Code, and are sufficient to ensure 50 ohm nominal electrical compatibility and common module thickness. The remaining fields define more fully the mechanical compatibility and the minimum installation details. See Annex A.

The full coding of the module will identify the following:

- Field 1: the category of substrate
- Field 2: substrate dielectric constant
- Field 3: module thickness
- Field 4: substrate thickness
- Field 5: module width
- Field 6: carrier mounting arrangements
- Field 7: module length
- Field 8: RF input position(s)
- Field 9: RF output position(s)
- Field 10: diametrically opposed DC ports option

3.1.1 Field 1: the category of substrate

Any type of microwave circuit or combination of circuits which meets the constraints imposed by this specification is permitted.

The MiCM20 family is split into two main categories which are differentiated by the particular type of substrate being used for the module RF interfaces, where significantly different interconnection techniques may be required:

- CATEGORY C — This class will contain the ceramic/crystalline types of material which are suitable for conventional wire or ribbon micro-bonding techniques for interconnects.
- CATEGORY S — This class will contain the softer materials such as PTFE and plastic mixtures which require soldering techniques or more specialized micro-bonding techniques for interconnects.

As new materials become available, classification will depend on the bonding techniques appropriate to these materials.

3.1.2 Field 2: substrate dielectric constant

Substrate relative dielectric constants are permitted up to a maximum value of 16 for RF ports.

3.1.3 Field 3: module thickness

The thickness of the module at the interfacing region is specified in this specification according to the MiCM20 Type code (See Annex A) and must remain uniform throughout this region. The three options for the module thickness in these regions, including substrate are:

- A: 1,27 mm (0,050 inches)
- B: 1,91 mm (0,075 inches)
- C: 3,18 mm (0,125 inches)

For the case of a flanged carrier, the top surface of that carrier, other than beneath the substrate(s), must be at least 0,08 mm below the top surface of the substrate (see Figure 6). If a RF track is carried across the flange (eg. Figure 13), the flange thickness will be determined by the substrate thickness. For particular applications the flange may be chamfered at each corner (see Figure 4).

For RF ports the carrier shall extend without increase of thickness for a minimum of 0,3 mm in-board from the corresponding module edge.

3.1.4 Field 4: substrate thickness

The thickness of the substrate in the interfacing region is similarly specified according to the MiCM20 Type Code (Annex A). The eight values of preferred thickness are:-

- 1: 0,13 mm (0,005 inches)
- 2: 0,19 mm (0,0075 inches)
- 3: 0,25 mm (0,010 inches)
- 4: 0,38 mm (0,015 inches)
- 5: 0,51 mm (0,020 inches)
- 6: 0,64 mm (0,025 inches)
- 7: 0,79 mm (0,031 inches)
- 8: 1,02 mm (0,040 inches)

(Metric thicknesses have been rounded to two significant figures)

This thickness is included within the module thickness; apart from this consideration there are no constraints on combinations of module and substrate thicknesses. (A manufacturer will, however, apply practical constraints to ensure an appropriate carrier thickness. Some guidance is provided by Annex B, Preferred Module Short Code Options).

3.1.5 Field 5: module width

Module widths are in multiples of 6 mm up to a maximum of 24×24 mm, or 30×24 mm if flanged.

3.1.6 Field 6: carrier mounting arrangements

There are three physical arrangements for mounting modules to a baseplate, coded as follows:

- F and FC : flanged carrier and chamfered carrier, screw fixing from above.
- UF : unflanged carrier, fixed with solder or conductive epoxy adhesive.
- B : unflanged carrier with tapped locating boss for screw fixing from below.

NOTE This specification does not stipulate the method of mounting the substrate on to the carrier, nor the material of the carrier, but these will be included in the Custom Detail Specification. More than one substrate, or indeed a partial substrate, may be mounted on a carrier provided the interface grid restrictions are unaffected. An example of such a circuit is given in Figure 5. It should be noted, in the example illustrated, that an alternative identifier is required. (See clause 3.5.1.).

3.1.7 Field 7: module length

Module lengths are in multiples of 6 mm up to a maximum of 24×24 mm, or 30×24 mm if flanged.

3.1.8 Field 8: RF input position(s)

The preferred RF signal input connection(s) shall be at the front edge of the MiCM20. The precise positions are defined in the MiCM20 Type Code. Where there is no RF input port, the eighth field shall be denoted "X". Multiple ports shall be listed in numerical order separated by commas. (See Annex A).

3.1.9 Field 9: RF output position(s)

The preferred RF signal output connection(s) shall be at the rear edge of the MiCM20. The precise positions are defined in the MiCM20 Type Code. Where there is no RF output port, the ninth field shall be denoted "X". Multiple ports shall be listed in numerical order separated by commas. (See Annex A).

3.1.10 Field 10: diametrically opposed DC ports option.

If this is not required the letter "N" (Normal) is used. If the alternative option is required the letter "R" (Reverse) is used. (See Annex A).

This alternative MiCM20 port arrangement permits a diametrically opposed reversal of DC and control connections which is useful for certain systems applications. It allows direct access to common supply lines and grounding systems, irrespective of the direction of RF signal flow in the system and no matter which side of the RF line the power supply circuitry is situated. See Figure 15 & Figure 16.

3.2 Module Interfaces

3.2.1 Interfacing regions

These refer to the RF interconnection region between cascaded MiCM20s. In the case of a flanged module with a RF interface on the side, the substrate will be extended across the flange to the edge of the module to maintain the 50 ohm impedance requirement.

Note that the substrate need not cover the whole of the carrier surface, but it will always be extended to the module edge for RF interconnection purposes.

The substrate shall not overhang the carrier.

3.2.2 RF Input/Outputs

These refer to the RF function(s) or transmission path(s) of the module, for example:

- Input and output ports for a microwave filter or coupler (through line) or amplifier or attenuator module, or cascade thereof.
- Input and lower frequency output for a mixer (frequency down-converter) module.
- Input and higher frequency output for a frequency up-converter or multiplier module.
- Input for a load termination or detector module.
- Output for an oscillator module.
- Inputs and outputs for a three-way power combiner.

There are preferred positions for such RF ports, which facilitate standardized interconnections of various sized modules in two dimensions (see clause 3.5).

3.2.3 RF Ports

These are designated ports having nominal 50 ohm characteristic impedance levels, which are located at the edge(s) of the module. Other (non-RF) ports are electrical ports which do not require this constraint, and which may be at the edge of the substrate but which may or may not be at an edge of the module.

3.2.4 Interface VSWR (VOLTAGE STANDING WAVE RATIO)

This refers to the interface discontinuity VSWR for two appropriately sited RF ports on adjacent modules. For a pair of RF ports as defined in clause 3.2.3 above, there will be some reflection at the interface if the MiCM20 Short Codes are not identical. If the module thicknesses are equal and the MiCM20 preferred substrate/module thicknesses (see Annex B) are used, the interface VSWR will be low. (Techniques exist to eliminate the uncertainties due to an imperfect termination and/or other RF measurement inaccuracies).

3.2.5 Module VSWR

The module VSWR is to be defined as a limiting condition in the Customer Detail Specification (see Annex E) as measured in a Standard Test Fixture for the designated RF port under declared functional conditions.

3.3 Mechanical Specification

See Annex C for the definition of the following aspects of an MiCM20.

Front

Rear