

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Semiconductor devices –
Part 16-10: Technology Approval Schedule (TAS) for monolithic microwave
integrated circuits

Dispositifs à semiconducteurs –
Partie 16-10: Format-cadre pour agrément de technologie (TAS) pour circuits
intégrés monolithiques hyperfréquences



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES –

**Part 16-10: Technology Approval Schedule (TAS)
for monolithic microwave integrated circuits**

FOREWORD

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International Standard IEC 60747-16-10 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

This bilingual version (2013-01) corresponds to the monolingual English version, published in 2004-07.

The text of this standard is based on the following documents:

FDIS	Report on voting
47E/257/FDIS	47E/262/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been partially drafted in accordance with the ISO/IEC Directives, Part 2 (2001). It also follows the requirements given in IEC QC 210000:1995, Technology Approval Schedules – Requirements under the IEC Quality Assessment System for Electronic Components (IECQ-CECC).

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be



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		<p>Issue</p> <p>QC 210021 2004-07</p>

Foreword to this particular Technology Approval Schedule (TAS)

The IEC Quality Assessment System for Electronic Components (IECQ) is composed of those member countries of the International Electrotechnical Commission (IEC) that 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 specifications and quality assessment procedures for electronic components and by the granting of an internationally recognized mark or certificate of conformity. The components produced under the System are acceptable in all member countries without further testing.

This TAS has been prepared for use by those countries taking part in the System who wish to issue national harmonized specifications for Technology Approval of manufacturers of monolithic microwave integrated circuits. It should be read in conjunction with the current regulations of the IECQ-CECC System.

At the date of printing of this schedule the member countries of IECQ-CECC are China, Denmark, France, Germany, India, Italy, Japan, Republic of Korea, Netherlands, Norway, Russian Federation, Switzerland, Thailand, Ukraine, United Kingdom, USA and Yugoslavia. Copies of this schedule can be obtained from their National Authorized Institutions, National Standards Organizations or, in case of difficulty, from the Central Office of IEC in Geneva, Switzerland (fax 41 22 9190300) as described in the Specifications List QC 001004 on www.iecq-cecc.org.

Organizations responsible for preparing the present TAS (standards.iteh.ai)

IEC subcommittee 47E: Discrete semiconductor devices

Preface

<https://standards.iteh.ai/catalog/standards/sist/6a8483ee-1794-44cd-8953-ec22c2b186bc/iec-60747-16-10-2004>

This schedule was prepared by SC47E/WG2.

It is based, wherever possible, on the publications of the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) and in particular on:

- IEC 60747-16-1: Semiconductor devices – Part 16-1: Microwave integrated circuits – Amplifiers,
- IEC 60747-16-2: Semiconductor devices – Part 16-2: Microwave integrated circuits – Frequency prescalers,
- IEC 60747-16-3: Semiconductor devices – Part 16-3: Microwave integrated circuits – Frequency converters,
- IEC 60747-16-4: Semiconductor devices – Part 16-4: Microwave integrated circuits – Switches.

INTRODUCTION

The requirements for Technology Approval for manufacturers of electronic and electro-mechanical components are given in QC 001002-3, Clause 6. The procedures for approval defined in that clause require the manufacturer to have available an appropriate Technology Approval Schedule (TAS).

This schedule defines how the principles and requirements of QC 001002-3, Clause 6, are applied to monolithic microwave integrated circuits.

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SEMICONDUCTOR DEVICES –

Part 16-10: Technology Approval Schedule (TAS) for monolithic microwave integrated circuits

1 General

1.1 Scope

This TAS specifies the terms, definitions, symbols, quality system, test, assessment and verification methods and other requirements relevant to the design, manufacture and supply of monolithic microwave integrated circuits in compliance with the general requirements of the IECQ-CECC System for electronic components of assessed quality.

1.2 Normative documents

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027 (all parts): *Letter symbols to be used in electrical technology*

IEC 60050: *International Electrotechnical Vocabulary*

IEC 60068 (all parts): *Environmental testing*
<https://standards.iteh.ai/catalog/standards/sist/6a8483ee-1794-44cd-8953-ec22e2b186bf/iec-60747-16-10-2004>

IEC 60191-2: *Mechanical standardisation of semiconductor devices – Part 2: Dimensions*

IEC 60617-DB¹ (all parts): *Graphical symbols for diagrams*

IEC 60747-1: *Semiconductor devices – Discrete devices and integrated circuits – Part 1: General*

IEC 60747-16-1: *Semiconductor devices – Part 16-1: Microwave integrated circuits – Amplifiers*

IEC 60747-16-2: *Semiconductor devices – Part 16-2: Microwave integrated circuits – Frequency prescalers*

IEC 60747-16-3: *Semiconductor devices – Part 16-3: Microwave integrated circuits – Frequency converters*

IEC 60747-16-4: *Semiconductor devices – Part 16-4: Microwave integrated circuits – Switches²*

IEC 60748-1: *Semiconductor devices – Integrated circuits – Part 1: General*

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

¹ DB¹ refers to the IEC on-line database.

² To be published.

1.3 Units, symbols and terminology

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

IEC 60027: *Letter symbols to be used in electrical technology*

IEC 60050: *International electrotechnical vocabulary*

IEC 60617-DB: *Graphical symbols for diagrams*

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

Any other units, symbols and terminology specific to the scope of this TAS shall be taken from the relevant IEC or ISO documents listed under Normative documents.

1.4 Standard and preferred values

Technology Approval allows the customization of the component or process to suit each customer. The conventional concept of preferred values may thus have limited application. However, when internationally recognized preferred values apply these should be used, e.g. voltage, temperature and dimensions. Reference shall be made to the appropriate IEC or ISO publications, i.e.:

- voltage IEC 60747-1
- temperature IEC 60747-1
- dimensions IEC 60191-2.

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1.5 Definitions

For the purposes of this document, the following definitions apply.

IEC 60747-16-10:2004
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1.5.1 General terms for monolithic microwave integrated circuits

1.5.1.1 microelectronics

(IEC 60748-1, definition 4.1.5)

1.5.1.2 microcircuit

(IEC 60748-1, definition 4.2.2)

1.5.1.3 integrated circuit

(IEC 60748-1, definition 4.2.3)

1.5.1.4 integrated microcircuit

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 to 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.

1.5.1.5**micro-assembly**

microcircuit consisting of various components and/or integrated microcircuits 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 use of qualifying terms: semiconductor multi-chip micro-assembly; discrete component micro-assembly.

1.5.2 List of abbreviations

- ASIC: Application Specific Integrated Circuit
- BDS: Blank Detail Specification
- BICMOS: Bipolar and Complementary Metal Oxide Silicon
- CAD: Computer Aided Design
- CAE: Computer Aided Engineering
- CECC: CENELEC Electronic Components Committee
- CMB: Contract Management Branch
- Cpk: Index of critical process capability
- Die Shear: Test on die attach
- DIL: Dual In Line Package
- DRC: Design Rules Check
- Dye Penetrant (ZYGLO): Seal test
- EDP: Electronic Data Processing
- EFR: Electrical Failure Rate
- ERC: Electrical Rules Check
- ESD: Electro Static Discharge
- GaAs: Gallium Arsenide
- HBT: Hetero-junction Bipolar Transistor
- HEMT: High Electron Mobility Transistor
- ISO 9000: ISO International Quality Rules
- JFET: Junction Field Effect Transistor
- LRM: Line Reflect Match
- LSSD: Level Sensitive Scan Design
- LVS: Layout Versus Schematics
- MESFET: Metal Semiconductor Field Effect Transistor
- MMIC: Monolithic Microwave Integrated Circuits
- MODFET: Modulation Doped Field Effect Transistor
- MTF: Mean Time to Failure
- MTBF: Mean Time Between Failures
- MTTR: Mean Time To Repair
- NMOS: Metal Oxide Silicon N channel

- OS: Operating System
- PAS: Publicly Available Specification
- PCM: Process Control Monitor
- PDA: Percentage Defectives Allowed
- PM: Parametric Monitor
- PMOS: Metal Oxide Silicon P channel
- POST CAP: Inspection after Encapsulation
- PRE CAP: Inspection before Encapsulation
- QA: Quality Assurance
- QCI: Quality Conformance Inspection
- QML: Qualified Manufacturer List
- RIE: Reactive Ion Etching
- SEC: Standard Evaluation Circuit
- SEM: Scanning Electron Microscope
- SI: Supervising Inspectorate
- SOI: Silicon on Insulator
- SOLT: Short Open Load Thru
- SOS: Silicon on Sapphire
- SPC: Statistical Process Control
- Si: Silicon
- TADD: Technology Approval Declaration Document
- TCI: Technology Conformance Inspection
- TCV: Technology Characterization Vehicle
- TDDB: Time Dependent Dielectric Breakdown
- TQM: Total Quality Management
- TRB: Technology Review Board
- TRL: Thru Reflect Line
- VT: Threshold Voltage for FET
- ZYGLO: see Dye Penetrant.

NOTE PCM and PM have the same meaning; however, PCM is the term used in the following subclauses.

1.5.3 Definitions relevant to the scope of the TAS

See QC 001002-3, Clause 6 for definitions specific to Technology Approval.

2 Definition of the component technology

2.1 Scope

The Technology Approval for the declared range or family of components shall include their design and manufacturing processes and their interfaces. The overall management of these interfaces by the Control Site shall be included. These processes and interfaces shall be declared within the Technology Approval Declaration Document (TADD).

More detailed requirements for the listed processes and interfaces to be included within the Technology Approval are given in the relevant clauses of this TAS. The processes are listed below with the identification of the MAIN TECHNICAL PROCESS:

- Process characterization
- Integrated circuit design – This is a MAIN TECHNICAL PROCESS
- Mask manufacture
- Wafer fabrication – This is a MAIN TECHNICAL PROCESS
- Back-side process
- Wafer probe
- Assembly – This is a MAIN TECHNICAL PROCESS
- Test and release – This is a MAIN TECHNICAL PROCESS
- Packaging and shipping

Shipping includes the temporary storage of finished products before shipment to the customer.

2.2 Description of activities and flow charts

2.2.1 Description of activities

All the activities (processes) shall be identified with the relevant flow charts included. This information may include different processes for different types of components but covered by the same technology. Where applicable, these should address all the processes listed in 2.1.

The design and manufacturing cycle of integrated circuits may involve one or more qualified company or facility handling different tasks within the “life cycle” of an MMIC.

Design, development or specification of an MMIC is performed to the specific requirements of a customer, which may be an external customer (such as for an application-specific MMIC), or an internal department.

The prime contractor is that organization which undertakes the responsibility for the management of all tasks prior to the supply of an MMIC to the specified requirements.

2.2.2 Flow charts

The flow chart in Figure 1 is an example showing such operations, where the specific stages are expected to be defined, referencing the relevant internal documentation.

2.3 Technical abstract

2.3.1 TADD abstract (not for publication)

The Technology Approval technical abstract shall be declared by the technology approval declaration document (TADD).

For each technology declared the following shall be identified:

- Description of design tools used e.g. CAD systems, software;
- Description of wafer fabrication processes including feature size, technology, types and number of interconnects
 - e.g. 0,5 µm gate, GaAs MESFET, double layer metal;