

EMQMS101D

Quality Manual

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Introduction

This document is Energy Micro's Quality Manual according to ISO9001-2008

1. Revision Records

Revision Number	Effective Date	Change Description	Author	Reviewed	Approved by QA Manager
0.1	2010-11-19	Created	Z. Shaher		
1.0	2010-12-29	Updated and restructured	G. Forre		Z.Shaher
2.0	2011-04-05	Updated input and output for sec 8.0,9.0,10.0 and 11.0	Z.Shaher	G. Forre	Z.Shaher

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2. Introduction

Energy Micro is a fabless semiconductor company that develops, markets and sells the world's most energy friendly integrated circuits. The company was founded in 2007 by experienced semiconductor professionals with proven track records at many other successful semiconductor companies.

Energy Micro produces innovative technology and works closely with industry-leading partners and customers worldwide to arrive at ground-breaking solutions. The first family of products introduced by Energy Micro was the 32-bit EFM32 Gecko microcontroller, based on modern and powerful microprocessor architectures. The EFM32 product family consumes many times less energy than comparable products in the market and can be used in a broad range of energy sensitive applications.

In 2010 Energy Micro has also started development of EFR, the world's most energy friendly radio integrated circuits.

Energy Micro integrated circuits are sold worldwide and the company's goal is to always deliver qualified, reliable and tested products to its customers.

Energy Micro is a highly customer-oriented company and is committed to supply products and services that conform to the requirements of our customers – in terms of price, delivery, and quality. To achieve this, a quality consciousness permeates the organization and it is recognized that the work of every Energy Micro employee affects the quality of our products and services.

Energy Micro focuses on its customers' interests and its primary task is to fulfil and surpass customer expectations. All of Energy Micro's preventative measures and continuous improvements are based on fact, and through everyone's commitment Energy Micro continuously develops and improves the quality of its work.

3. Quality System Purpose and Scope

This Quality Management Manual defines the policies and procedures used by Energy Micro to ensure that its products and services meet both the specified requirements of its customers and its own business objectives in a consistent, economical and reliable manner.

Energy Micro's quality management system documentation is written, implemented and maintained to meet the requirements of ISO 9001:2008 with a scope of registration for:

Development, characterization, test, manufacturing through subcontractors, marketing and sales of ENERGY EFFICIENT MICROCONTROLLERS, RADIOS AND OTHER SEMICONDUCTOR DEVICES.

The purpose of this manual and the associated procedures is to describe the manner in which Energy Micro successfully operates and maintains a reputation of quality and reliability. In this manual Energy Micro identifies the processes that are essential to its quality management system. The sequence, interaction and management of these processes are described in this manual together with their supporting procedures.

Energy Micro strives to continually improve its core processes as well as the quality system as a whole. Energy Micro continuously analyses and sets the quality objectives to improve its products, using formal processes in its quest to achieve customer satisfaction, using methods and techniques that foster continuous improvement and good business practices.

The policies and procedures contained in this manual are intended to establish and communicate the minimum requirements that all groups at Energy Micro must attain. These requirements are based on the requirements of customers as well as applicable international and national standards. These requirements will be updated as the needs of customers and relevant standards are changed and for the purposes of continuous improvement in the quality system.

This Quality Manual describes the quality management system within Energy Micro and is a controlling document in the organization that aims to ensure high quality in everything the company does. The Quality Manual also serves as a tool with the following aims:

- To establish a common basis for the detailed EMQMS procedures and processes used within Energy Micro
- To inform Energy Micro employees, customers, suppliers and relevant authorities of the EMQMS
- To identify roles, responsibility and authority for quality

4. Quality Policy and Objectives

4.1. Quality Policy

“At Energy Micro we are committed to excellence and delivers superior and defect-free product with exemplary customer service and competitive cost “

4.2. Quality Objectives

The key objectives of Energy Micro’s quality initiatives are

- a) Aligning all employees with a common quality system and work processes
- b) Driving continual improvement in quality and efficiency
- c) Ensuring that all Energy Micro products meet or exceed our customers’ quality and reliability expectations

The Quality objectives description is documented in [EMQMS103D Quality Objectives](#)

5. Organization Overview and Core Processes

5.1. General

Energy Micro Management is highly committed to ensuring and improving quality at all levels of work within the organization.

The main responsible for the Quality System at Energy Micro is the VP of Operations who acts as the Management Representative.

At regular intervals the Energy Micro Management performs internal reviews of the Quality System.

5.2. Company Organization

Energy Micro AS has six functional areas: Chip product definition and roadmap (CTO), Engineering, Simplicity, Operations, Sales & Marketing, and Finance & Administration. The Chief Executive Officer, Chief Technology Officer and the Vice-Presidents constitute the Executive Management of Energy Micro AS, depicted in Figure 1. The leader of these individual areas may serve a dual role in both this functional role set forth below and a role in a departmental structure as it may, from time-to-time, serve the needs of the present and future customers. Additionally, multiple people in a departmental structure may, from time-to-time, satisfy the functional roles set forth below. Following are the various Energy Micro AS areas and their responsibilities. Authority to execute these responsibilities in the best interest of our customers is implicit.

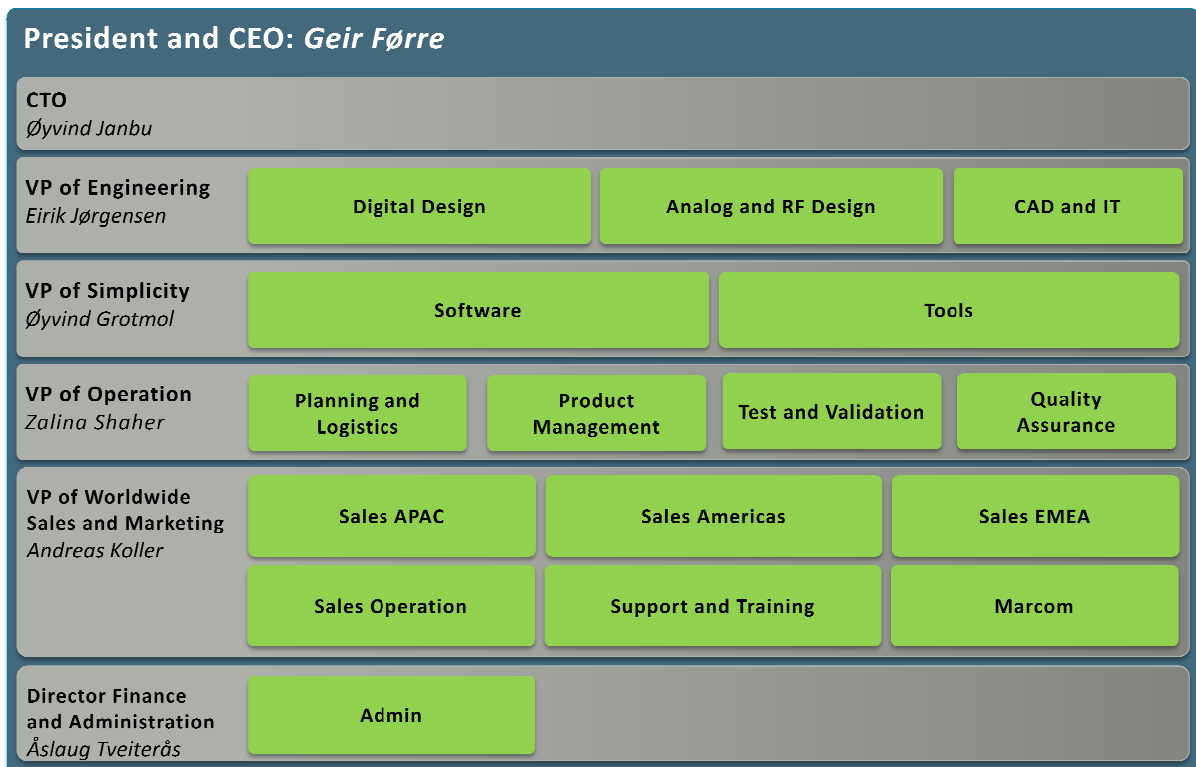


Figure 1: Organizational Overview

5.2.1. Chip Product Definition and Roadmap

The CTO at Energy Micro is responsible for the chip product definition and roadmap. The chip product definition includes chip products, chip product series and chip product families as further defined in section 8.

5.2.2. Engineering

The Engineering Department is responsible for all integrated circuit development projects at Energy Micro. A development project starts with the specification of products that fit into the defined market. Continuous focus is then applied to a methodology that secures excellent product quality, minimizes time to market and stimulates innovative solutions. The project ends when a product has been transferred to volume production and responsibility is taken over by the Operations Department.

5.2.3. Simplicity

The Simplicity Department is responsible for the development of tools and software that support the product and help product designers at customers reduce hardware and software development time.

5.2.4. Operations

The Operations Department is responsible for Energy Micro's overall Quality Assurance, test development, product management and volume production of all Energy Micro products and all services related to order processing and product delivery to customers.

5.2.5. Sales & Marketing

The Sales & Marketing Department at Energy Micro is responsible for worldwide sales, marketing, customer support, revenue growth, design wins and market demand forecast.

5.2.6. Finance & Administration

The Finance & Administration Department is responsible for Human Resources and personnel and the overall financial well-being of the company and its administration

5.3. The Core Processes: 5 Pillars to support Energy Micro and Customers Success

The core processes of Energy Micro are:

- Chip Product Definition and Roadmap (see chapter 8)
- Chip Development (see chapter 9)
- Simplicity (see chapter 10)
- Operations (see chapter 11)
- Sales and Marketing (see chapter 12)

Figure 2 shows how these overall processes are connected in the Energy Micro Quality Management System.

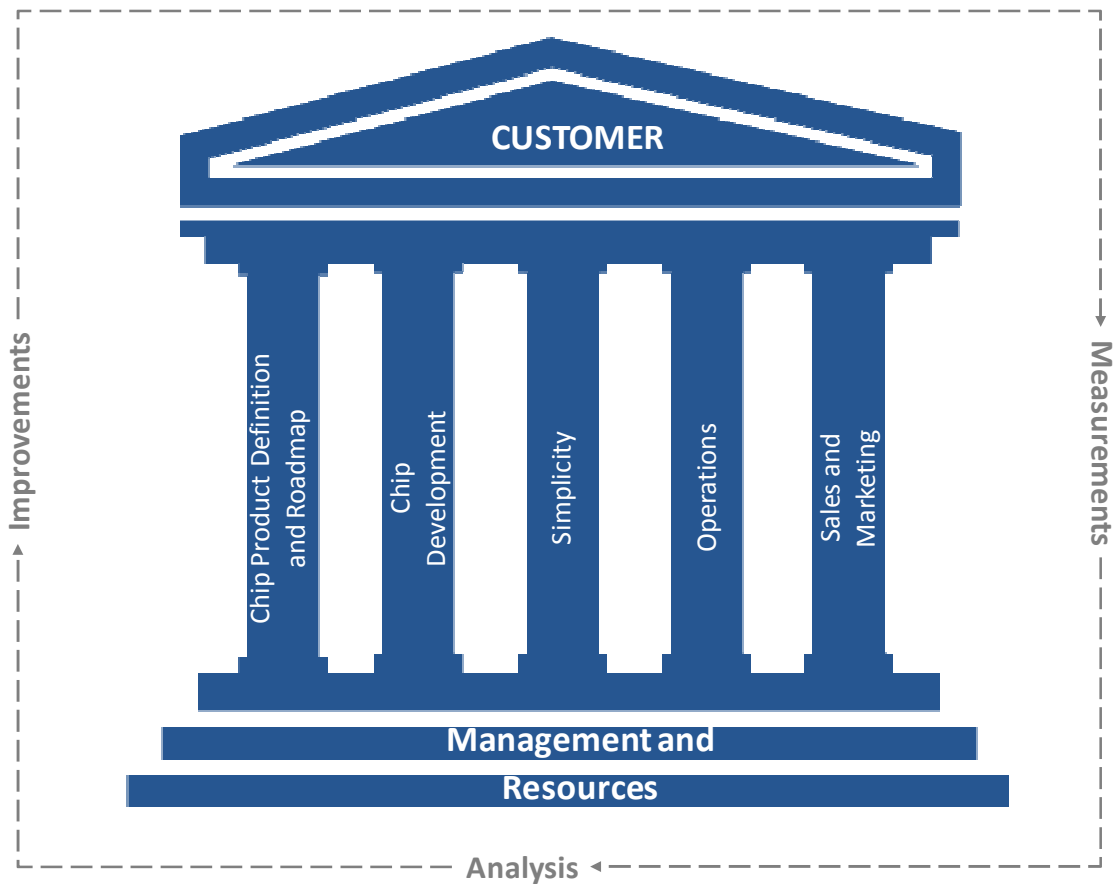


Figure 2: The 5 pillars of Energy Micro and Customer's success (Core Processes)

5.4. Outsourced Processes

Energy Micro is a fabless semiconductor company and there are a number of processes that are outsourced. The most important are:

- Manufacturing of silicon wafers and integrated circuits
- Assembly (integrated circuit bonding, packaging and marking)
- Production testing of packaged chips
- ESD- and latch-up tests (as part of reliability testing)
- Starter kit and Development kit production

The control of these processes is carried out according to the [EMQMS611P Supplier Management](#).

All subcontractors used by Energy Micro are world-leading within their sectors, and all have certified quality systems according to ISO 9001 and QS 9000. When adding new subcontractors to Energy Micro's fabless semiconductor model, a supplier evaluation is performed.

The characterisation testing of Energy Micro's standard product chips is not outsourced, and is always performed by Energy Micro.

The qualification testing (including ESD, latch-up and reliability) is outsourced to subcontractors.

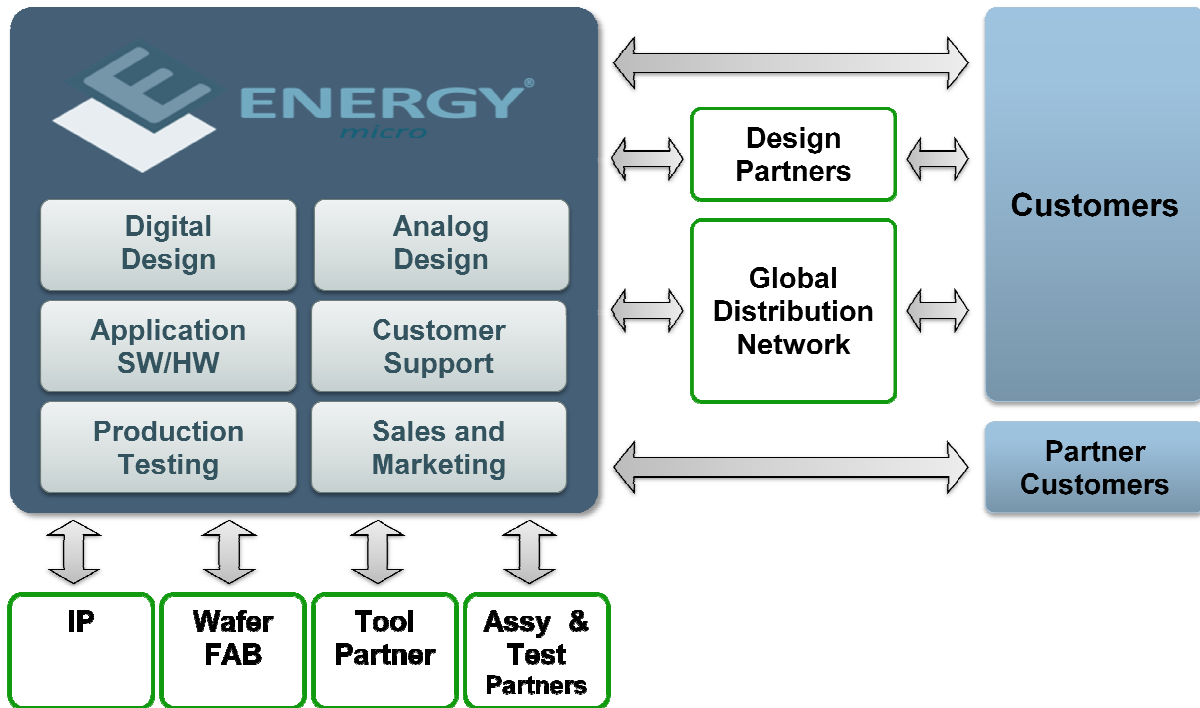


Figure 3: Energy Micro Supply Chain and Partners

6. Quality Management System

6.1. Documentation Structure

Energy Micro's quality management system documentation ensures effective operation and control of its business processes. The quality management system documentation is designed to meet the requirements of ISO 9001:2008.

Four levels of documentation are defined in the quality management system:

- LEVEL 1 : Quality Manual
- LEVEL 2 : Quality Documents, Procedures and Guidelines describing how quality management system processes are conducted in compliance with the ISO 9001:2008 requirements.
- LEVEL 3: Work Instructions, detailed project checklists, templates, etc. describing in detail how activities affecting quality and customer satisfaction are performed.
- LEVEL 4: Quality Records

Figure 4 describes the documentation structure.



Figure 4: Document structure of Energy Micro's Quality Management System

The approval, issue and control of this Quality Manual, the Quality Procedures, the Quality Policy and all Energy Micro quality system documentation are described in: [EMQMS811P Control of Documents](#).

The Quality Manual is classified as an open document and can be accessed through Energy Micro's external web page www.energymicro.com

The Quality Manual is located at the directory: *T:\08 QA\EMQMS\EMQMS100 Quality Manual*.

Quality Policy is located at the directory: *T:\08 QA\Quality Policy*.

The document [EMQMS102D Overview of Energy Micro's Quality documents](#) includes an overview of all documents in the EMQMS system.

Subdirectories include the various procedures, documents, checklists etc. The latest revision is indicated by the highest revision number.

6.2. Document Control

All critical work processes have documented procedures, work instructions, and data associated with them.

Energy Micro's quality management system and all important information sources and documents affecting quality, are controlled by the [EMQMS811P Control of Documents](#), which ensures that outdated or inaccurate information is not used and that appropriate information is available where it is needed.

All documentation is reviewed and approved prior to use and changes to documentation are also reviewed, approved and controlled.

Documents are maintained in such a manner as to ensure that they remain legible, readily identifiable and retrievable. Any such documents that become obsolete are disposed of or are marked to prevent use.

In order to maintain control of the electronic version of the quality system documents and data that are maintained on Energy Micro's intranet, regular back-ups with internal and external backup-storage are performed and anti-virus software used.

6.3. Quality Records

Records are maintained to document effective implementation of the quality management system and to provide evidence of conformity to requirements of ISO9001-2008. Data and other information generated as the result of work processes are considered to be quality records. Work area procedures define the type of records needed, location and manner of collection, retention times, retention responsibility, storage media, and disposal requirements.

The [EMQMS831 Control of Quality Records](#) specifies the control of quality records.

7. EMQMS200 Management and Resources

7.1. Management Commitment

The management at Energy Micro is fully committed to ensuring and improving quality at all levels of work.

7.2. Customer Focus

Energy Micro is a highly customer-oriented company, and customer focus is emphasized at all levels within the organization. Special focus is set on determining and understanding customer requirements. The company aims to meet these requirements and to learn from customer feedback in order to continuously improve its quality system.

7.3. Annual Operational Planning and Quarterly Operational Reviews

7.3.1. Annual Budget and Planning Process

Once every year during the autumn the management team is preparing the annual budget and annual operational plan for the following year. The following elements are involved. The plan process includes the following elements:

- Review of expected income the coming year
- Review of main activities planned for the coming year
- Review of required resources to sustain the planned activities for the coming year

The results of the process are:

1. Financial plan (budget) for the following year
2. Operational plan for the company and departments including defining Key Performance Indicators for the coming year and setting the KPI goals.

The financial plan and operational plan shall be approved by the board of directors which is typically done in December or January.

7.3.2. Quarterly Operational Reviews

Each quarter the management team will conduct a quarterly operational review to measure and monitor how the company and departments are performing versus the defined goals and KPIs. Records are being stored.

7.3.3. Relation between Quarterly Operational Reviews and EMQMS

During the Quarterly Operational Reviews, potential negative gaps in performance versus plan that partly or in whole are linked to limitations in the EMQMS or are due to a violation of the EMQMS shall be identified and recorded in a combined finding report and appropriate corrective and preventive actions shall be performed.

7.4. Regular Management Meetings

The management team have regular management meetings (typically bi-weekly) to:

- Exchange and report status on activities within the different departments
- Discuss and make decisions on important/strategic topics

The management meetings are performed according to: [EMQMS211P Management Meetings](#).

7.5. Responsibility, Authority and Communication

7.5.1. Responsibility and Delegation of Authority

Every manager is responsible for the quality of his/her operation and the results of the operation. This implies among other things responsibility for:

- Setting goals, controlling, following up and improving the department's operations.
- Ensuring that the results correspond to requirements and goals.
- Continuous improvement of employees' personal development, competence and professional skills.
- Making sure that the quality policy and customer requirements are known, understood and applied by everyone in daily work.
- Ensuring that the unit follows the existing quality system and changes or improvements become known and implemented.

The documentation related to responsibilities is described in the job descriptions for most of the positions within the company. The delegation of authority is defined in: [EMQMS221P Authority Definition](#).

7.5.2. Management Representative

Energy Micro's Chief Executive Officer with the responsibility for the quality management system, has appointed the VP of Operations as the Management Representative.

The Management Representative has the authority and responsibility to maintain a quality management system compliant to ISO9001-2008.

The Management Representative is responsible to ensure that the processes necessary for the quality management system are identified, implemented, maintained and reviewed for opportunities to make improvements.

The Management Representative is responsible for evaluating the effectiveness of the quality system and reporting to the Management Team and other attendees at scheduled Management Review Meetings, and for making suggestions to improve the system.

The Management Representative also ensures that employees are aware of the importance of meeting customer requirements and how those requirements relate to their work activities.

7.5.3. Internal Communication

Although informal communication is an effective method of transmitting information relating to products and processes, formal mechanisms are in place to document and facilitate such communication. The Management Team meets on a regular basis, and the different Departments have their own regular meetings.

The effectiveness of internal communications and any further formalization of such communication are considered during Management Review Meetings.

The effectiveness of the quality management system processes are communicated to the various levels and functions of Energy Micro through use of quality system documentation, training, Internal Audits (and subsequent reporting), the Document Control and Corrective and Preventive Action Systems and Management Review Meetings.

Overview of the Internal Communication of Energy Micro is described in [EMQMS212P Internal Communication](#)

7.6. EMQMS Management Review

EMQMS Management Review Meetings are held to assess and evaluate the quality system to ensure its continued effectiveness and suitability in satisfying the requirements of ISO 9001:2008 and Energy Micro's stated quality policy and objectives. Reviews are carried out as frequently as necessary, but at least annually.

Topics discussed during the meeting and resulting action plans are recorded in Management Review Agenda and Minutes, which are maintained as quality records in accordance with the [EMQMS831 Control of Quality Records](#).

The general agenda followed during the Management Review by the Management Team aims to review the current performance and improvement opportunities arising from the results of internal audits, customer feedback, process performance/trends and product conformance, the status of corrective and preventive actions, and follow-up actions from previous meetings. Other inputs to the meeting include customer satisfaction data.

The [Key Performance Indicators](#) (which are also being reviewed during Quarterly Operational Reviews) will be specially reviewed against the Quality Objectives to identify systematic gaps. Potential improvements in the EMQMS that will help minimize future gaps shall be identified and recorded.

The quality policy and quality objectives are also reviewed for their continuing suitability.

Management Review also includes quality system planning to ensure that changes in processes are evaluated and that quality system requirements are addressed prior to their implementation. In addition, the Management Review Meetings serve as a forum where Energy Micro may evaluate potential problems and take actions to prevent their occurrences.

Outputs from Management Review Meetings (which are recorded in meeting minutes), include action items regarding the improvement of the quality management system, improvement of products in relation to customer requirements, and the identification of any resources needed to ensure the continuing satisfaction of customers. Findings during the Management Review shall be documented by standard Findings Reports according to the [EMQMS841P Corrective action and Preventive action](#).

7.7. Human Resources

Energy Micro's success depends on the quality and motivation of its employees. Energy Micro therefore focuses on recruiting the right people for the organization. The recruitment guidelines are described in [EMQMS251G Recruitment](#).

Energy Micro establishes job descriptions and provides necessary training to employees to ensure that the quality of products, processes, and services is reinforced at all levels of the organization; to minimize errors, drive continuous improvement to optimize customer and employee satisfaction, and to maintain a safe working environment. One important element of this is the on-boarding procedure of new employees which is described in [EMQMS261P Employee Onboarding](#).

Energy Micro has an annual employee appraisal process to motivate employees to achieve quality objectives, to make continual improvements, and to maintain an environment that promotes innovation. This process also measures how each individual contributes to the achievement of company KPIs and quality objectives. The procedure for the annual employee appraisal is described in [EMQMS271P Employee Appraisal](#).

The Management Team ensures that staffing and skill levels within the organization are appropriate for ensuring the optimal efficiency and effectiveness of Energy Micro's operations. As part of quality planning, attendees of Management Review Meetings identify company-wide training needs in light of any new business developments or new technologies to be adopted.

For the purposes of ensuring that customers and partners are invoiced correctly, as well as enabling Return On Investments (ROI) analysis, each employee at the Energy Micro headquarters shall record work time according to the procedures described in [EMQMS292P Working Time Registration](#).

Energy Micro shall conduct its business in an ethical way. Effective ethics is a team effort involving the participation and support of every Energy Micro employee and the following ethics policy shall be followed: [EMQMS231P Energy Micro Ethics Policies](#).

7.8. Infrastructure

Management ensures that Energy Micro facilities are maintained appropriately to achieve conformity of the product. This includes workspaces, equipment and any supporting services related to facilities maintenance.

All written or electronic documents at Energy Micro shall be stored according to the procedure: [EMQMS291P Electronic and Document Archiving](#).

The IT infrastructure of the company is described in the document: [EMQMS281D IT Infrastructure Overview](#).

Since virtually all vital company information is in the form of electronic documents and files, electronic backup is of the highest importance. The procedure for backup is described in [EMQMS282P Electronic Backup](#).

7.9. Work Environment

Management ensures that the appropriate human and physical factors of the work environment are considered and provided. Consideration of such factors includes health and safety conditions, work methods, handling methods, and ambient working conditions. Such considerations are assessed during Management Review Meetings and through frequent dialogues with employees.

7.10. Legal

All agreements with customers and suppliers shall be reviewed and approved by management.

For Non-disclosure agreements the following procedure applies: [EMQMS241P Non Disclosure Agreements](#).

8. EMQMS300 Chip Product Definition and Roadmap

All new product development at Energy Micro follows a documented development process. A formal project review and approval, by responsible management, is completed and documented at critical points in the development process. The process is designed to manage organizational interfaces and communication between groups involved in the development process. Figure 5 below shows the different stages from new product idea until shipments to customers.

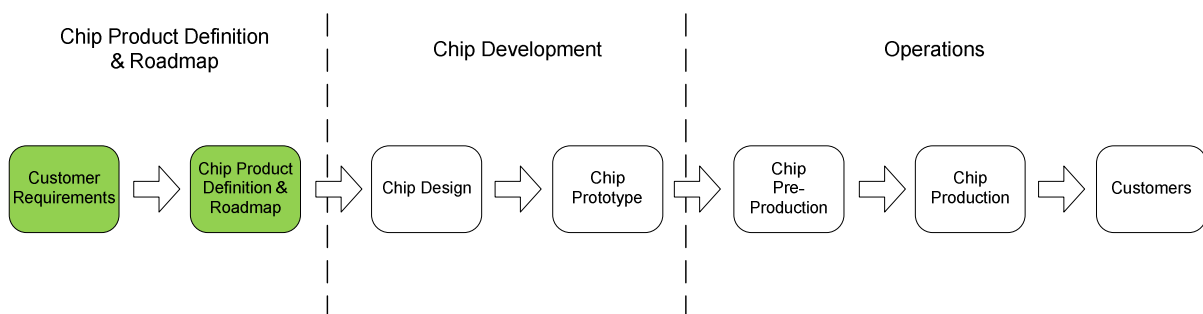


Figure 5: Phases in new product development – Chip product Definition & Roadmap

The CTO is responsible for the first part of this process (the blocks highlighted in green in Figure 5) which involves:

- Input
 - Evaluation of customer and market needs
 - Review of specification with lead customers
 - Review of chip product definition and roadmap during chip development
- Output
 - High level specification of new chip products, chip product series or chip product families
 - Establishment of product family matrix
 - Initial decision of manufacturing process and assembly technology
 - Initial estimation of manufacturing cost and gross profit margins
 - Review of chip product definition with management team or board of directors

Some of these activities will be completed after the chip development has started and there will typically be several iterations of the product definition and roadmap during the chip development phase.

The detailed description of this phase is described in: [EMQMS311P Chip Product Definition and Roadmap](#)

9. EMQMS400 Chip Development

9.1. General

The chip development phases of the product development are the most time and resource consuming parts of product development. These phases are also associated with the highest risks of delays and highest risk of errors.

A plan, which is updated as the product status changes, is generated detailing the product and customer requirements, the required resources, the development activities, the responsible function for each activity, and the timeline for the project. Management is responsible for ensuring that the resources necessary for completion of the project are available.

Since many functions contribute to a development project, cross-functional teams integrating the appropriate skills are used during the development process. The development team meets periodically to facilitate the sharing and coordination of project activities. Every specified project phase task needs to be completed or accounted for before proceeding on to the next phase.

Key product characteristics are verified during development to ensure that they meet defined requirements and are reviewed at the team meetings or at the formal reviews. Design simulations are performed against the fabrication process design rules before initial manufacturing. A risk analysis is done against the product design. Initial silicon is characterized and verified against the

product requirements. A final validation of the product occurs prior to formal product release and the results documented. The validation process and acceptance criteria may be product, market, and/or customer specific and is defined in the product development plan.

All new products must pass reliability qualification. The qualification plan is part of the product development plan. Prior to release to manufacturing, new products must meet manufacturing requirements identified in the project plan.

Design failures are documented and procedures for corrective and preventive action followed in addressing such failures. The development process itself is periodically reviewed and learning are fed back into the process.

Figure 6 illustrates the two phases that are involved under Chip Development; Chip Design and Chip Prototype.

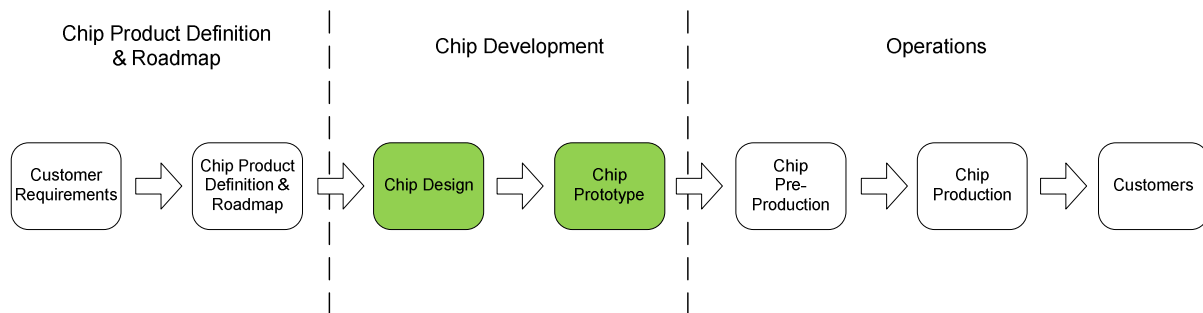


Figure 6: Phases in new product development – Chip Development

9.2. Chip Design

The Chip Design phase includes the following main activities:

- Input
 - Module reviews
 - Top level design, simulation and layout
 - Top level reviews
- Output
 - Test specifications (for characterisation and production test)
 - Detailed specification of product and product family
 - Detailed module specification
 - Module design, simulation and layout

The following procedures and guidelines are relevant for this phase:

- [EMQMS411P Chip Design](#)
- [EMQMS415G Analog Design Methodology](#)

- [EMQMS416G Digital Design Methodology](#)

9.3. Chip Prototype

The Chip Prototype phase includes the following main activities:

- Input
 - Planning and specification of characterisation and manufacturing test development
 - Characterisation of product/product families
- Output
 - Prototype manufacturing of product/product families
 - Finalization of first manufacturing test program
 - Finalization of datasheet(s) and reference manual

The following procedures and guidelines are relevant for this phase:

- [EMQMS412P Chip Prototype](#)
- [EMQMS413G Issue and Bug Tracking](#)
- [EMQMS421P Chip Characterization](#)
- [EMQMS414P Datasheet and Reference Manual](#)
- [EMQMS641P Test Program Release](#)
- [EMQMS651P Package Qualification](#)

10. EMQMS500 Simplicity

10.1. General

“Simplicity” is one of the core company values of Energy Micro. The target is to provide tools, software and infrastructure around the integrated circuits to enable a very seamless and effective development process for Energy Micro’s end-customers. The Simplicity department is overall responsible for all activities related to Simplicity. The main elements include:

- Software Development
 - Development of software libraries to be used by customers
 - Development of software related to development and starter kits
 - Development of software tools
- Hardware Development
 - Design of new development and starter kits
 - Design of associated PCB boards
- 3rd party relationships with:
 - Tools vendors
 - Software vendors
 - Design partners

10.2. Customer input

Energy Micro is a highly customer oriented organization, and every service provided by Energy Micro shall be carried out according to the customer's expectations and needs. Customer needs and customer requirements are the key fundamentals for all software development, hardware development and establishment of 3rd party relationships. Customer inputs are gathered in one or more of the following ways:

- Feedback from customers on limitations in existing software and hardware products
- Proactive communication with customers in relation to new planned hardware and software developments
- Collaboration with customers on developing new hardware and software

10.3. Development Kits and Software Definition

The VP of Simplicity is responsible for defining new development kits and software to be developed. New kits and software releases are typically needed for new chip product series, and new tools and software libraries provide added value for both existing and new chip products.

- Factors considered in the definition (input)
 - Customer input
 - Impact on customers' development times
 - Technical feasibility
 - Differentiating opportunities versus competition
 - Effort level required
- Output
 - Roadmap for software development
 - Roadmap for tools development

10.4. Software Development

The planning, development, review and test of software is performed according to [EMQMS551P Software Development](#).

10.5. Hardware Development

The planning, development, review and test of hardware is performed according to [EMQMS561P Hardware Development](#).

10.6. 3rd Party Relationships

The success of Energy Micro and its customers depends to a significant degree upon the establishment and maintenance of 3rd party relationships with tools vendors, software vendors and design partners. Before engaging with any third party, Energy Micro shall review the following aspects:

- Strategic fit to Energy Micro's product and services
- Quality of their products offerings

11. EMQMS600 Operations

11.1. General

The quality of Energy Micro’s products is dependent on the quality of purchased materials and services. The purchase process is documented and structured to meet the following requirements:

- Ensure that purchasing documents clearly describe the product ordered
- Ensure that purchased products conform to purchase requirements
- Communicate to suppliers the appropriate product, quality, and delivery requirements
- Ensure that purchased materials and services used meet government, safety, and environmental regulations
- Ensure that finished product, direct & packing materials meet the provisions of regulatory and customer requirements

Figure 7 illustrates the phases that are involved under Operations: Pre-production, Chip Production and shipments to customers.

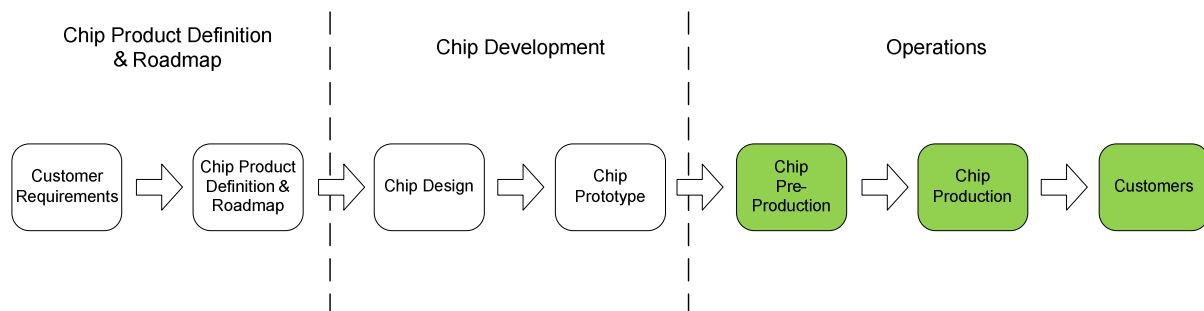


Figure 7: Phases in new product development – Operation

11.2. Supplier Management

This section uses the term “Supplier” for both suppliers and subcontractors. The supplier management process ([EMQMS611P Supplier Management](#)) is structured to:

- Identify and select suppliers with the capability to meet Energy Micro’s needs
- Establish criteria for selection, evaluation, qualification, and certification of suppliers
- Ensure continuity of supply
- Ensure that critical materials and services are purchased only from qualified sources
- Ensure that only accredited external laboratories are used
- Monitor and provide feedback on supplier performance

- a) monitor product quality and delivery performance

Energy Micro seeks to select suppliers that are certified to the ISO9001 Quality Standard.

Suppliers are expected to maintain 100% on-time delivery performance. Energy Micro verifies the quality of some materials and services by inspection of incoming material, review of supplier provided data, verification at the supplier's premises, or receipt of successful completion of applicable 2nd or 3rd party assessments. The level of control applied is dependent on the effect the purchased material has on the product realization process. When suppliers have demonstrated their ability to provide the level of quality required by Energy Micro, inspection and/or data review may be reduced or eliminated. Records are maintained of the evaluation and qualification of suppliers.

Occasionally, customers may ask to perform inspections at one of Energy Micro's supplier sites. When such a request is made, the requirement is communicated to the supplier and necessary arrangements are made. However, even when a customer performs such an inspection, Energy Micro is still responsible for the quality of all products delivered by that supplier to the customer.

Records are maintained to demonstrate conformance to these requirements.

11.3. Chip Pre-Production

The Chip Pre-Production phase includes the following main activities:

- Input
 - Optimization and stabilization of assembly process
 - Verification of test programs, correlation and hardware
 - Manufacturing assessment of assembly and test for readiness to start full production
 - Define package qualification requirement

- Output
 - Pre production product families assembly build moved from engineering equipment to production equipment
 - Monitoring of yield stability in flash test, assembly and final test
 - Monitoring of test time
 - Package qualification started

The following procedures and guidelines are relevant for this phase:

- [EMQMS641P Test Program Release](#)
- [EMQMS651P Package Qualification](#)
- [EMQMS631P Purchasing Control](#)
- [EMQMS621P Yield Monitoring](#)

11.4. Chip Production

The Chip Production phase includes the following main activities:

- Input :
 - Review of yield data for test and assembly
 - Review of the qualification data
 - Review of overall manufacturing and quality system setup
- Output
 - Products are fully qualified
 - 12 month rolling forecast of chip production to ensure Bill of Material availability and capacity allocation
 - Quarterly Blanket purchase order with bi weekly work order releases for assembly and test
 - Continuous monitoring of yield, quality and delivery performance.
 - Test time reduction
 - Yearly process audit

The following procedures and guidelines are relevant for this phase:

- [EMQMS641P Test Program Release](#)
- [EMQMS631P Purchasing Control](#)
- [EMQMS621P Yield Monitoring](#)
- [EMQMS611P Supplier Management](#)

11.5. Identification and Traceability

Product is identified from raw materials through all stages of production and shipment to the customer. The tracking procedure: [EMQMS671P Product Identification and Traceability](#) includes:

- Assignment of a unique identifier to each lot or batch of material
- Assignment of a unique identifier to each product / device where feasible
- Recording of the completion of each process step and the inspection and test status
- Recording of pass/fail quantities
- Identification of key process information as defined in work instructions
- Recording of key process parametric data as defined in work instructions
- Traceability to key raw materials and the production process as needed

11.6. Control of Monitoring and Measurement Equipment

Control of monitoring and measuring devices at Energy Micro that requires instrument calibration of laboratory equipment, is done according to [EMQMS661P Calibration and ESD](#)

This procedure ensures that:

- All instruments are registered with unique identification labels

- All instruments that are subject to calibration are marked with last calibration date, and calibration expiry date
- Instruments are calibrated within the documented intervals against traceable measurement standards
- Instruments are protected from damage by use of ESD protection
- Instrument calibration is established, administered, and utilized to maintain EMQMS improvement.

Records of the results of the instrument calibration are maintained according to [EMQMS831P Control of Quality Records](#)

12. EMQMS700 Sales and Marketing

12.1. General

The Sales and Marketing department of Energy Micro is engaging with customers on a day to day basis and customer requirements are frequently being fed back to the product definition, development teams and management teams.

12.2. Marketing Material

The release of marketing material shall follow the procedure: [EMQMS712P Release of Marketing Material](#).

12.3. Sales Related Processes

12.3.1. Customer Surveys

Customer Satisfaction Survey is performed at regular intervals, and shall be reviewed by the management in a Management Review Meeting. The survey is performed by sending out a questionnaire to Energy Micro's customers and distributors who can give a score to various aspects of the impression and experience with Energy Micro. The customer surveys should follow the [EMQMS711G Customer Survey Guideline](#).

12.3.2. Sales Reporting and Sales Review

The sales reporting and quarterly sales reviews are performed according to [EMQMS721P Sales Reporting and Review](#).

12.3.3. Quotations and Pricing Authority

The procedure for providing special pricing quotes to the distributors is: [EMQMS723P Distributor Quoting](#).

The pricing authority is defined in this procedure: [EMQMS722P Pricing Authority](#).

13. EMQMS800 Measurement, Analysis and Improvement

13.1. General

The Management Team ensures that data regarding products, processes and supplier performance, as well as customer satisfaction is collected, recorded and analysed. Although measurements of such performance indicators may be collected quarterly or as it becomes available, such data is analysed annually during Management Review Meetings (see section 7.6). Continual improvement is also assessed and further planned at that time.

Planning for measurement and monitoring activities (like normal quality planning) occurs at two levels: a broad company-wide level, and a product/project/contract specific level.

The Management Team evaluates the effectiveness of measuring and monitoring activities during Management Review Meetings, where further application of such activities is also considered, including the use of statistical techniques. Any such activities identified are implemented according to the resulting action item plan, which is recorded in the Management Review Meetings Agenda and Minutes controlled by the [EMQMS831P Control of Quality Records](#). This level of planning is focused on achieving improvement of the quality management system with the aim to improve processes and overall result for the company.

The Management Representative and/or his/her designate are responsible for determining the appropriate measuring and monitoring activities used during production and inspection in daily operations. Although these activities are also reviewed during Management Review meetings, this level of planning is focused on ensuring product conformity and timely delivery.

13.2. Monitoring and Measurement

13.2.1. Customer Satisfaction

Energy Micro is a highly customer-oriented company, and customer focus is stated by the Management Team as the most important factor for success.

Regular customer visits by representatives from the Management Team (CEO, CTO, VP of Worldwide Sales and Marketing, VP of Simplicity and VP of Engineering) take place in order to enhance customer engagement.

It is the responsibility of the VP of Worldwide Sales and Marketing to collect any feedback from customers and structure this data for Management Review. The customer surveys should follow the [EMQMS711G Customer Survey Guideline](#). Energy Micro is committed to follow-up and continuously improve its Quality Management System according to input from its customers.

13.2.2. Internal Audit

Energy Micro conducts periodic Internal Audits to determine whether or not the quality management system conforms to the requirements of ISO 9001:2008 and whether or not the system has been effectively implemented and maintained. Such audits are in accordance with the [EMQMS821P Internal Audits](#). The procedure defines the requirements for internal auditors, for conducting audits, and for recording the results and reporting them to management.

The steps for internal audits are:

- Management Representative develops an internal audit plan and schedules the audits. Some areas of the quality system are audited more frequently than others based on the importance of the activity. In any case, the complete system is audited at least once every year.
- Auditors: Personnel independent of the activity audited, qualified by training and experience, perform the internal audits.
- Corrective Actions: The results of the audits are recorded and brought to the attention of the personnel responsible for the area being audited and a corrective action request is initiated for non-compliance.
- Follow-up: Follow-up audits are conducted on the scheduled dates for completion of corrective actions. The auditor presents the results to the employees directly responsible for the quality activities audited.
- Closure: The action items or corrective actions are closed when the auditor determines that the actions taken are effective.
- Records from Internal Audit are controlled by the [EMQMS831P Control of Quality Records](#).

13.2.3. Monitoring and Measurement of Processes

The [Key Performance Indicators](#) are the key measures of the effectiveness and ability of Energy Micro's processes to achieve planned results.

Energy Micro's processes are measured through the regular Internal Audits and Management Review meetings. When planned results are not achieved, correction and corrective action shall be taken, as appropriate, following the general [EMQMS841 Corrective and Preventive Action](#).

13.2.4. Monitoring and Measurement of Product

Characteristics of products are monitored and measured by subcontractors during the manufacturing process to verify that product requirements have been met.

Product release does not proceed until all the planned arrangements have been satisfactorily completed, unless otherwise approved by Energy Micro.

Energy Micro selects and specifies the product parameters to monitor, and reviews that the subcontractor performs all measurements according to control plans.

Characterization and Qualification of new products and product families are performed according to the following procedures:

- [EMQMS421P Chip Characterization](#)
- [EMQMS651P Package Qualification](#)

Release of manufacturing test-programs and general software releases are performed according to the following procedures:

- [EMQMS641 Test Program Release](#)
- [EMQMS511P Software Development](#)

Yield monitoring and analysis is performed according to the following procedures:

- [EMQMS621P Yield Monitoring](#)

13.3. Customer Return

Customer return of integrated circuits shall be handled according to the procedure: [EMQMS861P Customer Return](#).

A register of all customer returns are maintained in: [EMQMS862D Customer Return Register](#).

13.4. Control of Non-conforming Product

All non-conforming products are controlled by the procedure: [EMQMS851 Handling of Non-conforming Material](#). The purpose of this procedure is ensure that non-conforming products are not shipped to customers or become subject to unintended use by customers or Energy Micro personnel.

Finding Reports relating to non-conforming products will be initiated as deemed appropriate.

Products that do not conform to specified requirements may be offered to customers for concession. Sales personnel, who ensure that the actual condition of the products is documented and communicated to the customer, negotiate such concessions. If non-conforming product is detected only after delivery or use has started, the Sales personnel and/or the Product Manager will ensure that all affected parties are aware of the non-conformity, including customers, end-users, regulatory bodies, and other bodies as appropriate.

13.5. Analysis of Data

Data collected during development, characterization and manufacturing of products are systematically analysed to determine whether the quality management system is suitable and effective. The evaluation of these analyses is done during the annual Management Review Meeting.

The [Key Performance Indicators](#) are the key measures of the suitability and effectiveness of the Energy Micro Quality Management System.

The Energy Micro processes and the [Key Performance Indicators](#) are measured through the regular Internal Audits and Management Review meetings. The Energy Micro processes are also followed up through weekly management meetings.

13.6. Improvement

Energy Micro focuses on continual improvement in its services and products.

The main procedure for continual improvement is the [EMQMS841P Corrective and Preventive Actions](#). The purpose of this procedure is to define the corrective and preventive action processes at Energy Micro that track the identification and resolution of product and service non-conformities as well as customer complaints.

All Energy Micro personnel are responsible for writing a [EMQMS8411T Finding Report](#) if a non-conformity or a potential non-conformity is observed within EMQMS; this is the first basic step in the corrective and preventive actions procedure. The Finding Report shall be sent to the VP of Operations or her designate who then follows up on the finding and appoints an assignee that will take the responsibility for taking the necessary actions.

Records related to corrective and preventive actions are controlled by the [EMQMS831P Control of Quality Records](#). All Finding Reports are stored in a corrective/preventive actions database together with the status of the finding: [EMQMS842P CAR PAR Register](#).

14. Overview of Energy Micro Quality System Documents

The document [EMQMS102D Overview of EMQMS Quality Documents](#) includes an overview of the main quality control procedures and other relevant information related to Energy Micro Quality Management System.

15. References

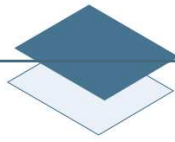
[1] : ISO 9001:2008(E), International Standard, Quality Management systems requirements, Fourth edition 2008-11-15

[2] : Cross Reference Table between Quality Manual Content to ISO9001_2008 Standard

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