NTC Thermistors

Quality and environment

Date: February 2009

Corporate goals

Our aim is to be a leader among the world's most competitive electronic components manufacturers. This aim is shared by the EPCOS quality and environment management system:

1 EPCOS quality system

1.1 Extract from EPCOS quality policy

- The quality of our products and services is a key part of our corporate strategy, whose principal aim is customer satisfaction.
- Our quality management system is continuously oriented to the international standards that place the highest demands on our entire organization.

1.2 Quality management system

The quality management system to ISO/TS 16949:2002 is applied throughout the company and is used to implement the EPCOS quality policy. The implications include:

- Product and process developments follow the principles of APQP[1)].
- Quality tools such as FMEA[2)], DoE[3)] and SPC[4)] minimize risks and ensure continuous improvements in conjunction with regular internal audits and QM reviews.

The documents of the quality management system are posted on the EPCOS Intranet.

1.3 Certification

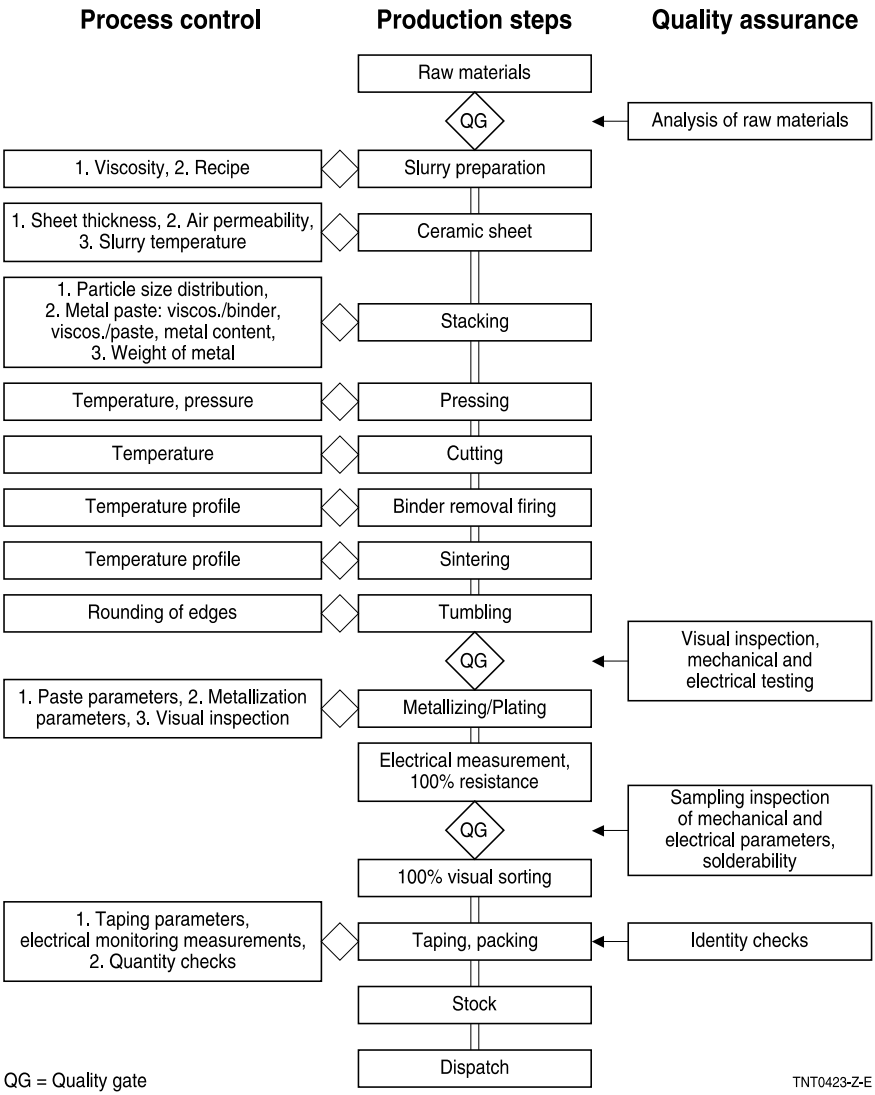
The EPCOS quality management system includes all EPCOS plants and sales organizations and forms the basis for the company certification to ISO 9001:2000 and ISO/TS 16949:2002. The company certificates are posted on the EPCOS Internet (www.epcos.com/quality).

1.4 Production sequence and quality assurance

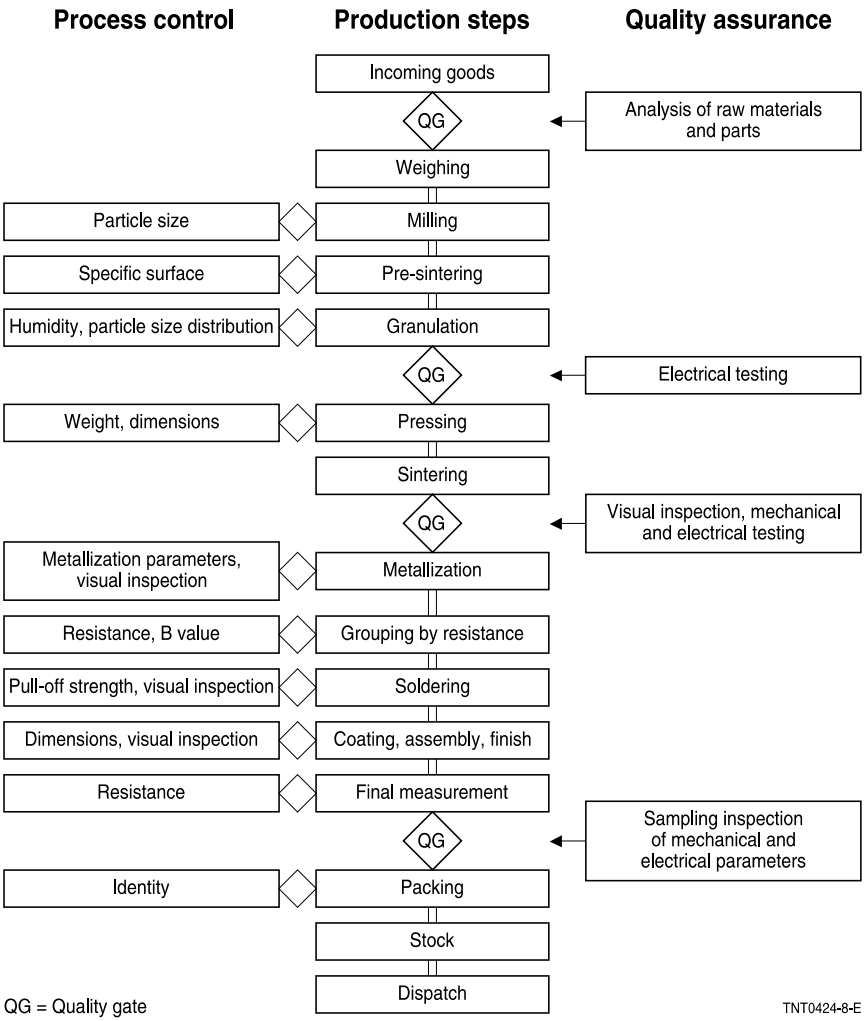
The business units implement the corporate guidelines for quality management in procedural and work instructions referred to products and processes.
The following example shows quality assurance applied to the production sequence of SMD NTC thermistors and NTC leaded disks.

1) APQP = Advanced Product Quality Planning
2) FMEA = Failure Modes and Effects Analysis
3) DoE = Design of Experiments
4) SPC = Statistic Process Control

Production process and quality assurance for SMD NTC thermistors



Production process and quality assurance for leaded NTC thermistors



1.5 Delivery quality

“Delivery quality“ means compliance with the relevant data specifications at the time of delivery.

1.6 Failure criteria

A component is defective if one of its features does not correspond to the specification of the data sheet or an agreed delivery specification.

1.7 Incoming goods inspection at the customer

For the incoming inspection, we recommend the use of a random sampling plan to DIN ISO 2859 Part 1 (contents compliant with MIL STD 105 D or IEC 410).
The test methods used and the AQL must be coordinated between the customer and suppliers.

1.8 Final inspection/approval for shipment

Final inspection verifies the major properties of the end products batch by batch, usually by means of fully automated selection tests.

Approval for shipment helps certify that products shipped comply with specifications. It includes:

- testing of principal parameters,
- identification check and visual assessment,
- examination of papers accompanying the batch.

1.9 Duration of use

The duration of use in terms of reliability is the time period during which random failures occur, i.e. the range in the product operating life in which the failure rate remains largely constant (early failures and end of operating life excepted). The value depends strongly on conditions of use.

1.10 Reliability

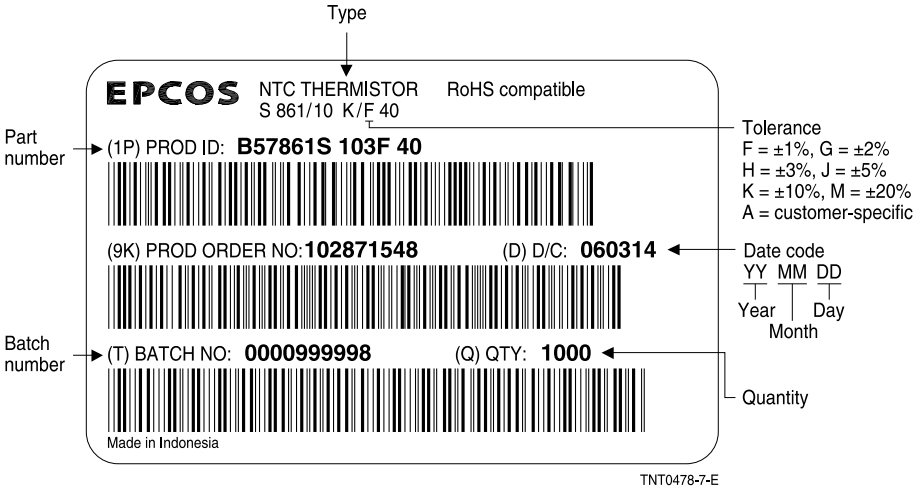
A variety of endurance tests and environmental tests are conducted to assure the reliability of NTC thermistors. These tests are derived from the extremes of expected application conditions, with test conditions intensified to obtain authoritative results within a reasonable period.

The reliability testing programs of EPCOS are based on the test plans of international standards and customer requirements.

EPCOS performs reliability tests to qualify new component families and for periodic requalification.

1.11 Bar code label

The packing of all EPCOS components bears a bar code label stating the type, ordering code, quantity, date of manufacture and batch number. This enables a component to be traced back through the production process, together with its batch and test report.



1.12 Conditions of use

EPCOS products may only be used in conformance with the technical specifications and assembly instructions and according to state of the art electrical and electronic engineering practices. Non-observance of limits, operating conditions or handling guidelines can lead to disturbances in the circuit and other undesirable consequences such as a higher failure rate.
In this connection, please note the “Important notes” on page 2.
Should you have any application-specific questions, please contact our experts for further information.

1.13 Customer complaints

If a fault occurs in a product despite careful manufacture and testing, please contact your local sales organization. The complaint will be registered with an RMA[5)] number and forwarded to the relevant technical departments for rapid handling.
EPCOS treats technical complaints according to the 8D methodology; i.e. with the use of interdisciplinary teams who aim to implement rapid countermeasures, introduce preventive actions and answer all complaints with an 8D report.

In order to be able to deal quickly and smoothly with complaints, the following data is needed:

- Number of components subject to complaint or returned
- Fault description
- How and when was the fault detected?
- Logistics data (date code, batch no., delivery note no.)
- Operating conditions
- Operating duration up to occurrence of the fault
- Measurement parameters in the case of divergent technical data

In the event of transport damage, we would ask you to describe this in detail and to mark it so that it can be distinguished from any further damage that might occur during the return shipment. The original package should also be checked and any damage to it described. In order to avoid further damage, the original packaging should also be used for the return shipment.

5) RMA = Return of Material Authorization

2 Environmental management system

2.1 Environmental policy

Our fundamental commitment to environmental protection is laid down in the EPCOS environmental policy.

EPCOS defines the following environmental protection principles:

- Above and beyond statutory and administrative requirements, we are continuously working to minimize the burden on the environment and to reduce consumption of energy and natural resources.
- We are taking all precautions necessary to protect our environment against damage.
- Potential impact on the environment is assessed and incorporated in product and process planning at the earliest possible stage.
- Our environmental management system ensures that our environmental protection principles are effectively put into practice. The technical and organizational procedures required are regularly monitored and updated.
- Each employee is required to act in an environmentally conscious manner. It is the constant duty of management to increase and encourage awareness of responsibility at all levels.
- We work with our business partners to promote conformity with similar objectives. We supply our customers with information on ways to minimize any potentially adverse environmental impacts of our products. We work in a spirit of cooperation with the relevant authorities.
- We inform the public of the impact on the environment caused by the company and our activities related to the environment.

2.2 Environmental management system

The EPCOS ISO 14001 based environmental management system is applied company-wide for implementing the EPCOS environmental policy. It is posted on the EPCOS Intranet.

2.3 Certification

The EPCOS Group operates an environmental management system that conforms to the requirements of ISO 14001 and is mandatory for all plants. The company certificate is posted on the EPCOS Internet: (www.epcos.com/environmental_management).

2.4 Special Legal Regulations regarding substances

2.4.1 RoHS

The term "RoHS-compatible" shall mean the following:

The components described as “RoHS-compatible” are compatible with the requirements of the regulations listed below (“Regulations”) and with the requirements of the provisions which will result from transformation of the Regulations into national law to the extent such provisions reflect the Regulations.

- Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment;
- ("Directive 2002/95/EC"); Commission Decision of August 18, 2005 amending Directive 2002/95/EC (2005/618/EC);
- and all Commission Decisions amending the Annex to Directive 2002/95/EC (e.g. 2005/717/EC, 2005/747/EC, 2006/310/EC, 2006/690 ... 692/EC, etc.).

2.4.2 REACH

According to Art. 33 we are obliged to inform our customers immediately - or consumers on request within 45 days - if we become aware that a product or it’s packaging contains more than 0.1% w/w of a Substance of Very High Concern (SVHC) that is published on the candidates list by the European Chemical Agency. EPCOS provides information relating to REACH on its website at www.epcos.com/reach (REACH Candidates List and Information according REACH Art. 33, concerning EPCOS Products)

2.5 Banned and hazardous substances in components

As a manufacturer of electronic components, we develop our products on the basis of the relevant standards and laws and thus ensure that they remain free of materials and substances defined as banned, unless they are exempted by the relevant legislation.

In order to guarantee a standardized procedure for EPCOS worldwide, a mandatory list of banned substances and substances of special interest is part of our environmental management system. The planning and development instructions include regulations and guidelines that aim to identify environmental aspects and to optimize products and processes with respect to material use and environmental compliance, to design them with sparing use of resources and to substitute hazardous substances as far as possible.

Consideration of the environmental aspects is monitored and recorded in the design reviews: the environmental officer provides support in the assessment of the environmental impacts of a development project.

2.6 Material data sheets for product families

EPCOS posts material data sheets on the Internet (www.epcos.com/material) that show typical compositions of product groups by selected representatives. The materials are listed with their percentage weight distribution with reference to the respective component.
As usual, all materials with a weight percentage exceeding 0.1 are listed. All specifications are typical data and may vary within a product group or production lot.
The material data sheets do not represent assured properties within the scope of the relevant legislation, but are merely provided for information purposes.
Please note in this connection the “Important notes“ on page 2.

2.7 Disposal

All NTC thermistors and sensors can be disposed off, reused or recycled. However as disposal is regulated by national law, the respective national provisions must be observed.