

## Quality specifications

### 1 Quality policy

#### 1.1 General

Our basic corporate goals and commitment to total quality are set down in our quality policy.

##### **Extract from the EPCOS quality policy**

The quality of our products and services is an essential part of our corporate strategy, whose paramount aim is total. Consistent application of a quality management system results in flawless products and a high level of user benefit from our components. Our quality management system reflects the most stringent international standards.

##### **Corporate goals**

Our aim is to play a leading role among the world's most competitive companies in electronic components. All quality management measures are geared to optimum customer benefit. They include:

###### *Mastery of processes*

Continuous improvement programs to narrow process tolerances, and to increase quality and yield.

###### *Enhanced productivity*

Continuous optimization of material, capital and human resources.

###### *Promotion of innovation*

Putting customer benefit first in every product we design. Determining customer needs in partnership with customers, and rapid implementation of agreements.

The EPCOS quality management system, which is documented in the new edition of the company-wide EPCOS Quality Management Handbook, is designed to support this strategy. It is the basis for planned certification of all EPCOS plants during the coming years to the ISO/TS 16949 standard issued in 2002.

An overview of the current status of certification will be found at the EPCOS website ([www.epcos.com/quality](http://www.epcos.com/quality)).

#### 1.2 Quality assurance

The required measures and regulations for quality assurance are documented in instructions on operations and procedures; the effectiveness and adequacy of the QA system are regularly checked in internal audits.

#### 1.3 Quality programs

Project-oriented improvement programs pursuing the strategic objective of zero defects are set up and conducted by specialist teams.

#### 1.4 Process assurance

Assurance of production processes starts as early as the planning and development phase. Quality tools like FMEA and SVP help detect and avoid potential errors, and safeguard process capability and product quality.

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Documentation of all production and testing steps as well as training of personnel are essential to flawless production.

Statistical process control (SPC) is used wherever applicable.

Permanent availability of plant is ensured by preventive maintenance.

### 1.5 Incoming inspection

Raw materials, parts and consumables undergo incoming inspection appropriate to their significance in the end product, unless this responsibility has been transferred to the supplier under a quality assurance agreement or similar.

### 1.6 In-process inspection

Wherever possible, in-process inspection is conducted to certify the conformity not only of intermediate products, but also of process supervision and control (e.g. SPC). It is generally integrated into the process steps and designed to be as preventive as possible, i.e. to avoid errors.

### 1.7 Final inspection

Final measurements and conformance tests ensure that the delivery quality is kept constant within defined tolerances.

Sampling plans are based on IEC 60410/DIN ISO 2859-1, acceptance level applied  $c=0$  for inoperatives.

### 1.8 Traceability

By recording the lot or batch numbers on the documentation accompanying the process, complete traceability in the production sequence is assured.

After delivery, traceability to the defined quality gates is ensured by the lot number, date code or serial, printed number on the product label.

### 1.9 Reliability

The reliability of a component is determined by the probable failures expected in a sufficiently large population after a specified period of time. Complex operating conditions and failure mechanisms prevent general predictions. For this reason reference reliability is to be understood.

### 1.10 Reference reliability

Reference reliability is the reliability for a particular, defined (reference) stress. It is stated as a failure quota and the respective load duration or life expectancy.

## Thermal design of capacitors for power electronics

### 1.11 Reference stress

The figures for failure quotas and load duration refer to the conditions in operation with rated specifications at the upper category temperature (see data sheet).

### 1.12 Failure criteria

Total failure:                   - open circuit  
   - short circuit  
   - leakage

Variation failure:               - exceeding limit values for capacitance drift

### 1.13 Failure quota $a_{FQ}$ and load duration $t_{LD}$

#### *Failure quota*

The failure quota indicates the number of permissible failures per  $10^9$  component hours.

#### *Load duration*

The load duration is the sum of all times during which voltage is applied.

#### *Typical figure for failure quota*

Typical figures for the failure quota are given in the individual data sheets.

### 1.14 Additional information, caution

**EPCOS products may only be used within the scope of their technical specifications, installation instructions and the state of the art. If you have any application-related questions, our specialists will be glad to advise you. Failure to observe critical limits, operating conditions or handling guidelines can lead to circuit malfunctions and other undesirable consequences, such as a higher failure rate.**

Quality data quoted by EPCOS is always statistical in nature, based on a number of components, and does not guarantee properties or performance in the legal sense. Customers may demand replacement of any defective components supplied. However, EPCOS' liability does not extend beyond replacement of defective components. This applies in particular to consequential damage caused by component failure.

Use of power capacitors in life support appliances, devices or systems where malfunction of these capacitors can be reasonably expected to result in personal injury is not authorized except with express written approval by EPCOS.

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### 1.15 Handling of complaints

As part of our quality-assurance system we attempt to eliminate all defects. The following details are helpful to us so that we can speedily process any complaints that nevertheless arise:

- description of fault
- when and how the fault was detected,
- operating conditions,
- length of operation before the fault appeared.

If damage occurs during transport, please describe it and, if possible, mark it so that it can be distinguished from any other damage that could occur during return of the items. The original packaging should also be examined and details given of any damage to this. To avoid further damage, use the original packaging, if possible, to return goods.

When packing, note the following:

Capacitors can contain dangerous residual charges. So never handle them by the terminations !

Before packing, short the terminations and connect them to the grounding terminal.