

JIS

JAPANESE INDUSTRIAL STANDARD

General Test Procedure
of Failure Rate for
Electronic Components

JIS C 5003—1974

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General Test Procedure of Failure Rate
for Electronic ComponentsC 5003-1974
(Reaffirmed: 1982)1. Scope

This Japanese Industrial Standard is applicable to electronic components, hereinafter referred to as the "components", to be produced continuously, under essentially the same design, and established quality control, on which a certain failure rate, during expected life time can generally be assumed; and specifies procedure for the initial judgement, maintenance, principle of expansion measuring interval, number of samples, test period, disposal of obtained results, etc. to determine failure rate level of the components in accordance with the single sampling inspection system by attributes.

Remark: The method to calculate the failure rate by numerical values and the method of application of the lot tolerance failure rate system to the lot tolerance percent defective system are also shown in Appendix.

2. Definitions

For the purposes of this standard, the following definitions apply:

- (1) failure Failure means that a component has lost its specified function.
- (2) failure rate Failure means the probability that a component will cause failure during a successive unit period, after the component has been operated without failure for a certain period.
- (3) failure rate level Expedient classification of failure rates, that the failure rates are classified into several groups, that is into levels and attached with symbols.

Remark: The failure rate in this failure rate level means the upper limit of failure rate of the lot desired to be rejected as possible.

- (4) confidence level The probability expressed in percentage (%) that a lot with a failure rate in the failure rate level of (3) will be rejected.
- (5) failure rate acceleration factor Components are tested under two different stresses, and if the reason of failure does not change, the ratio of failure rate under accelerated condition during a specified time, and that under reference condition * i.e. $\frac{\text{failure rate under accelerated condition}}{\text{failure rate under reference condition}}$ is called as the failure rate acceleration factor.

Note *: The test under reference condition means the test under the reference stress specified in the relevant component standard.

- (6) total testing time or total number of operation The total testing time or total number of operations means the sum of test times or of numbers of operation spent or done on all samples.

Remark: Total test time is called as component time, sometimes.

3. Confidence Level of Failure Rate

The confidence levels of failure rate used in this standard classified into shall be two kind i.e. 60 % and 90 %, and unless otherwise specified, shall be 60 %. However, the confirmation of maintenance of failure rate level is carried out under confidence level of 10 %.

4. Failure Rate Level

The failure rate level shall be expressed in such unit that the failure rate in percentage (%) per 10^3 h or number of failures per total number of operations of 10^6 is taken as the unit, and shall be selected from Table 1. However, as a rule, M, P, R, S, and T shall be used, and the others shall be used as occasion demands.

Table 1

Symbol	Failure rate (%/10 ³ h or 10 ⁻⁶ /time)	Symbol	Failure rate (%/10 ³ h or 10 ⁻⁶ /time)
L	5	R	0.01
M	1	E	0.005
N	0.5	S	0.001
P	0.1	H	0.0005
Q	0.05	T	0.0001

5. Testing Time or Number of Operations

The testing time or number of operations to calculate failure rate shall be as follows:

- (1) In the case of time, the testing time (including the time for extension test) shall be selected, generally from Table 2.

Further, when it is required to measure the specified test items at several points in time, the points shall as a rule be selected from Table 3. After reached to a certain time (for example, 1000 h), however, measurement may be made at a constant interval. In this case, the points in time at which the measurements are carried out, shall be recorded clearly.