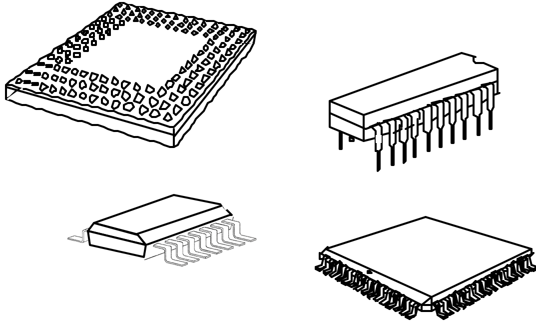
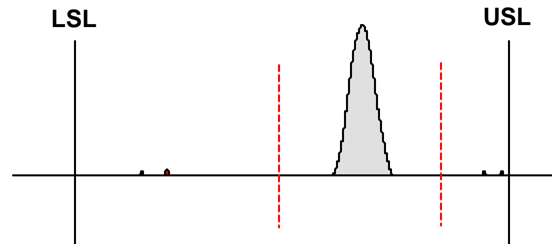
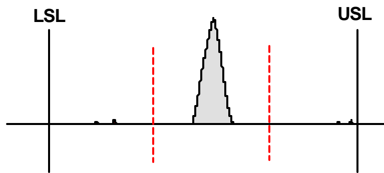
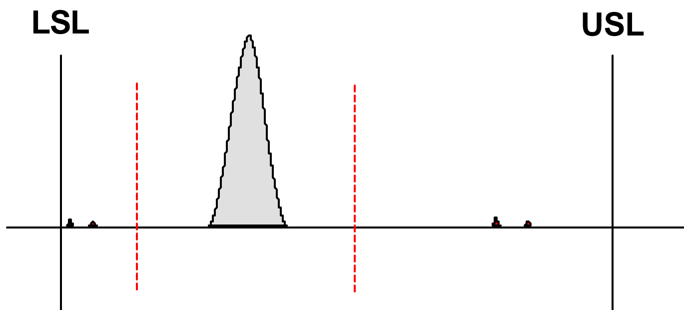
AEC - Q002 Rev A
August 25, 2000

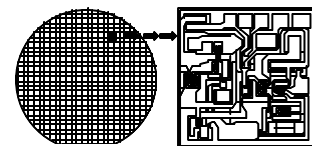






GUIDELINES FOR STATISTICAL YIELD ANALYSIS





Automotive Electronics Council
Component Technical Committee

Acknowledgment

Any document involving a complex technology brings together material and skills from many sources. The Automotive Electronics Council would especially like to recognize the following significant contributors to the development of this revision of this document:

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GUIDELINES FOR STATISTICAL YIELD ANALYSIS

Text enhancements and changes made since the last revision of this document are shown as underlined areas

1. SCOPE

This guideline is intended for use as a method for detecting and removing abnormal lots of material and thus ensuring the quality and reliability of the ICs supplied as meeting AEC - Q100 or 101. The principles described in this guideline are applicable to packaged or unpackaged die.

1.1 Purpose

This guideline describes a method, utilizing statistical techniques, of identifying a wafer, wafer lot or assembly lot that exhibits an unusually low yield or an unusually high bin failure rate. Experience has shown that wafer and assembly lots exhibiting these abnormal characteristics tend to have generally poor quality and can result in significant system reliability and quality problems.

Note: For best statistical yield limits (SYL) and statistical bin limits (SBL) results, use test limits based on PAT Limits as described in AEC Q001.

1.2 References

AEC - Q001 Guidelines For Part Average Testing
AEC - Q100 Stress Test Qualification For Integrated Circuits
AEC - Q101 Stress Test Qualification For Discrete Semiconductors

2. DEFINITIONS

2.1 PAT Limits

Part average test limits established per AEC - Q001.

3. METHOD FOR ESTABLISHING STATISTICAL YIELD LIMITS (SYL) AND STATISTICAL BIN LIMITS (SBL)

3.1 Detailed Description For Basic Wafer / Wafer Lot / Assembly Lot Level Yield Limits

Collect data from at least six lots and determine the mean and sigma value for the percentage of devices passing per lot and the percentage of devices failing each bin-out per lot (lot as used here could mean each wafer, a wafer lot or an assembly lot). Early in production of a part, when data

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from six lots is not available, data from characterization/matrix lots may be used. This data shall be updated as soon as production data is available. This early data shall be reviewed and updated using current data at least every 30 days during the first 6 months of production. The current data used shall include the data available since the last update or at least the last 8 lots. Older data shall not be used. After the first 6 months of production the limits shall be updated on a quarterly (every 3 months) basis. With this data determine the SYL and SBL (both on a wafer, wafer lot and assembly lot basis) as follows:

$$SYL_1 = \text{Mean} - 3\ \text{Sigma}$$
$$SBL_1 = \text{Mean} + 3\ \text{Sigma}$$

$$SYL_2 = \text{Mean} - 4\ \text{Sigma}$$
$$SBL_2 = \text{Mean} + 4\ \text{Sigma}$$

Any wafer or lots that fall below SYL_1 or exceed SBL_1 shall be held for engineering review. In addition, lots that fall below SYL_2 or exceed SBL_2 may be impounded and require customer notification before release, if specified in the applicable procurement document. Analysis shall be performed on failures to determine the failure mechanism(s) causing these abnormal failure rates.

3.2 Records

The supplier shall maintain records on all wafers, wafer lots and assembly lots that fall below SYL1 or exceed SBL_1. This data shall include the root cause for the yield problem and corrective action taken to prevent reoccurrence of the problem. It should also include any special testing or screens that were performed on the wafer, wafer lot or assembly lot and the customer that approved the shipment of the parts in question.

4. CUSTOMER NOTIFICATION

4.1 Procedure For Customer Notification

Before the customer is notified, the supplier shall have determined the failure mechanism(s) and, based on his experience, determine the corrective action required to prevent a reoccurrence of the condition in future product. The supplier shall also present data on a reasonable expectation of the seriousness of the failure mechanism(s) and it's impact on quality and reliability. Included in this data should be a plan for additional tests and screens which could provide the user with reasonable certainty that the product he receives will be at least equal to normal product.

4.2 Customer Response

The customer reserves the right to reject material that falls below SYL_2 or exceeds SBL_2 if the supplier data does not satisfy his concerns about the quality and reliability of the product.

4.3 If Customer Is Not Known

If the supplier does not know who the customer is and customer approval can not be obtained, the parts from the lots in question (lots falling below SYL_2 or exceeding SBL_2) shall not be supplied to distributors as meeting AEC - Q100 or Q101.

Revision History

Rev #	Date of change	Brief summary listing affected paragraph
-	July 31, 1997	Initial release
A	Aug. 25, 2000	Added Paragraph 1.2, Paragraph 1, 2.1, and 4.3 revised.