JEDEC PUBLICATION

Potential Failure Mode and Effects Analysis (FMEA)

JEP131C

(Revision of JEP131B, April 2012)

AUGUST 2018

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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Published by
©JEDEC Solid State Technology Association 2018
3103 North 10th Street
Suite 240 South
Arlington, VA 22201-2108

PRICE: Contact JEDEC

Printed in the U.S.A.

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (FMEA)

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Introduction

An FMEA is an anticipatory thought process designed to utilize as much knowledge and experience of an organization as possible toward the end of addressing potential issues defined in a new project. The objective is to reduce the probability that a customer is exposed to a potential product and or process problem by performing a thorough risk analysis.

A collection of subject matter experts from a number of various disciplines should be brought together to think about potential problems that could occur in a product and or process sometime in the future. Individuals do not necessarily have to be directly involved with the product and or the process; experience in a particular discipline may be of greater value than direct knowledge of the product and or the process. Ideally, representatives of the entire supply chain including customers and suppliers should also be contributors in the process.

Because of the need to continually improve whenever possible, there is a need for using FMEA as a disciplined technique to identify and help eliminate potential concerns.

It is meant to be a "before-the-event" action, not an "after-the-fact" exercise. To achieve the greatest value, the FMEA should be performed before a failure mode has been unknowingly planned into a product (DFMEA) and or process (PFMEA). Up front time spent in performing a comprehensive FMEA, when product and or process changes can be most easily and inexpensively implemented, will alleviate late change crises.

The outcome of the FMEA procedure should be a list of defined actions that will either prevent the occurrence of a problem through a design or process change, or improve the chances of detection of a problem through monitoring, if it does occur in the future. Actions are prioritized and decisions made as to which actions will have resources assigned for implementation.

It is not appropriate to compare one groups FMEA numerical rating with another groups FMEA, as each group’s knowledge and experience are unique. Since an FMEA procedure anticipates the future the numerical rating is a subjective value not an objective value.

A regular FMEA review can be conducted any time before a change is being made to a product design and or to a process or new knowledge about risks is generated by learning from field failures. An FMEA can also reduce or eliminate the chance of implementing a corrective change that could create an even larger concern. Properly applied, it is an interactive process that is never ending.

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(From JEDEC Board Ballot JCB-18-21, formulated under the cognizance of JC-14.4 Subcommittee on Quality Processes and Methods.)

1 Scope

This publication applies to electronic components and subassemblies product and or process development, manufacturing processes and the associated performance requirements in customer applications. These areas should include, but are not limited to: package design, chip design, process development, assembly, fabrication, manufacturing, materials, quality, service, and suppliers, as well as the process requirements needed for the next assembly. The publication covers the types of FMEAs described in Table 1.

The purpose of this document is to establish a minimum guideline for the application of Failure Mode and Effects Analysis techniques to improve quality, reliability, and/or consistency of electronic components subassemblies by continually evaluating the product and or process against potential failure modes. OEMs must provide suppliers with their manufacturing processes, their use conditions on the failed parts, and their failure experience(s). Suppliers must seek continuous improvement and have the responsibility of developing and improving the elements of FMEA.

Table 1 — Types of FMEAs

	DFMEA	**PFMEA**
Element to be assessed	Elements of a product (function / module) or process of record (POR)	Process steps of a production process or design flow
Potential failure modes	Deviations caused by the design of a process or product	Deviations in the process
Potential effects of the failures	Deviations from product specifications	Deviations from the process requirements

2 Terms and definitions

The following are the terms included in the body of the text. Definitions marked by an asterisk (*) are taken from JESD557, General Standard for Statistical Process Control (SPC). They are replicated here for completeness.

characteristic*: A distinguishing feature of a process or its output on which variables or attributes data can be collected.

design FMEA (DFMEA): A systematic method to assess the risks of the elements of a product or POR and their interactions in terms of functionality as defined by product or POR specification.

design of experiments (DOE): An efficient method of experimentation that identifies factors that affect the mean and variation with minimum testing.