ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

IPC-7912A

End-Item DPMO for Printed Circuit Board Assemblies

Developed by the DPMO and Assemblies, Attributes and Variables Identification Task Group (5-22g) of the Assembly and Joining Processes Committee (5-20) of IPC

Approved American National Standard
ANSI
January 27, 2004

Supersedes:
IPC-7912 - July 2000

Users of this publication are encouraged to participate in the development of future revisions.

Contact:

IPC
2215 Sanders Road
Northbrook, Illinois
60062-6135
Tel 847 509.9700
Fax 847 509.9798

Table of Contents

Figures

Tables

End-Item DPMO for Printed Circuit Board Assemblies

1 OVERVIEW

1.1 Scope This document is intended to define standard methods for the categorization of defects related to electronic printed board assemblies (PBAs). This document will provide consistent methodologies for calculating the following benchmark indices:

- Defects Per Million Opportunities Index (DPMO Index)
- Component DPMO
- Placement DPMO
- Termination DPMO
- Assembly DPMO

DPMO as applied in this standard is a measurement taken on completed product. Only those defects detected or discovered at an assembly's completed product evaluation are to be included in the calculations. A companion standard, IPC-9261 *In-Process DPMO and Estimated Yield for PWAs* is used to develop DPMO indices for measuring in-process assembly steps.

It is recognized that a manufacturing index can be obtained through a variety of methods. Overall Manufacturing Index (OMI) is explained in detail in Appendix B.

This document is intended to be used in conjunction with assembly acceptance standards such as IPC/EIA J-STD-001 or IPC-A-610. This document is for benchmarking and is NOT intended to describe how to track or otherwise log defect types or drive corrective action. In-process DPMO is outside the scope of this document.

Note: The intent of this document is to define ''how'' to arrive at several DPMO related indices. There is no intent to dictate the ''number'' of assemblies or data points that are needed to calculate these indices. Users of this document are cautioned when comparing one manufacturer's indices to one another due to differences in assembly complexity and the amount of data that may have been used in a computation.

1.2 Purpose To define a consistent method for calculating DPMO on completed electronic assemblies in order to benchmark the electronic assembly process.

- It is assumed that each printed board assembly that is inspected will be 100% inspected for all defects identified in Appendix A and only inspected PBAs will be used to determine opportunity count.
- 100% inspection efficiency is assumed.

1.3 Terms and Definitions

1.3.1 DPMO (Defects per Million Opportunities) is defined as the number of defects divided by the number of defect opportunities, multiplied by 1,000,000.

1.3.2 DPMO Index DPMO Index is defined as the total number of defects on a completed assembly divided by the total number of opportunities for that assembly, multiplied by 1,000,000.

2 APPLICABLE DOCUMENTS[1]

IPC/EIA J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies

IPC-A-610 Acceptability of Electronic Assemblies

3 CATEGORIZATION OF OPPORTUNITIES AND DEFECTS

3.1 Component Opportunities (o_c) The term ''component'' is defined as each device or piece of hardware that may be assembled onto a printed wire board (PWB). Solder, glue dots, and other similar assembly materials are not to be included in this DPMO calculation. The PWB is considered to be one component.

The total opportunity count for each ''component'' is one. An electronic component with multiple leads still counts as one. Processes, such as cleaning operations, do not add component opportunity counts. The finished PWA is not an opportunity.

3.2 Component Defect (d_c) A component defect is damage to a component exceeding the limits of the component specification, or those described in IPC/EIA J-STD-001 or IPC-A-610, and/or damage that results in non-usability of that component. Component defects include both visible defects and non-visible defects (physical/electrical). Even though a component may have more than one component defect; any one or combination of multiple component defects on any single component will have a maximum defect count of one for that component.

Example: A component could be both dimensionally incorrect and have major surface flaws, however, these result in a defect count of one.

3.3 Placement Opportunity (o_p) The term ''placement'' refers to the proper placement of components based on the bill of materials. Nonpopulated component locations each

1. www.ipc.org