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TECHNICAL REPORT

colour inside

Environmental testing –
Part 3-15: Supporting documentation and guidance – Vacuum-assisted reflow soldering



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Voids in solder joints 7
4.1 Type of voids 7
4.2 Reasons for voids 8
4.3 Influence of voiding on solder joint performance 9
5 Vacuum-assisted soldering processes 9
5.1 Purpose 9
5.2 Combination of soldering process with vacuum 9
5.3 Typical temperature-pressure-time curves 10
5.3.1 Convection soldering with vacuum 10
5.3.2 Vapour phase soldering with vacuum 11
5.3.3 Contact soldering with vacuum 12
6 Effect of vacuum when reflow soldering 13
6.1 General 13
6.1.1 General description 13
6.1.2 Physical basics 13
6.1.3 Vacuum parameters 14
6.1.4 Vapour phase vacuum reflow soldering 14
6.2 Components in the vacuum reflow soldering process 15
6.2.1 Influence of pressure differences 15
6.2.2 Influence of temperature, time, and vacuum 18
7 Vacuum equipment restrictions 18
7.1 General 18
7.2 Chamber size 18
7.3 Time to reach vacuum level 19
7.4 Cycle time 19
7.5 Summary 19
8 Typical defects after vacuum-assisted reflow soldering 20
8.1 Typical defect modes occurring at components 20
8.2 Component defect modes – summary 24
8.3 Soldering defect modes 24
8.3.1 Dropping of components 24
8.3.2 Bridging 25
8.3.3 Splattering 25
Bibliography 27

Figure 1 – X-Ray examples of voids in solder joints in different SMD-Components 8
Figure 2 – Reduction of voids with low flux soldering & preforms 8
Figure 3 – Example of a product for vacuum-assisted soldering processes 10
Figure 4 – Typical profile – vacuum-assisted convection soldering 11
Figure 5 – Typical profile – vacuum-assisted vapour phase soldering 12

Figure 6 – Typical profile – vacuum-assisted contact soldering 13
Figure 7 – Vapour pressure curve of Galden® 15
Figure 8 – Pressures to be considered 16
Figure 9 – Vapour pressure curve of water 17
Figure 10 – Blow Hole Void in/out of metallization 20
Figure 11 – Gas bubbles at metallization interface 20
Figure 12 – Gas bubble caused by residues in metallization defect 21
Figure 13 – Blow out void in solder meniscus 21
Figure 14 – Aluminium electrolytic capacitors with non-solid electrolyte, bulged 22
Figure 15 – Composite housing bursts in case of overpressure 22
Figure 16 – Housing mainly made of plastic bursts in case of overpressure 23
Figure 17 – Relay lock (polymer dot) blown off 23
Figure 18 – Housing with adhesive joint bursts in case of overpressure 24
Figure 19 – An example of bridging on BGA during vacuum assisted soldering 25
Figure 20 – Optimization with stepwise applying of vacuum to reduce bridging 25
Figure 21 – Splattering due to explosive outgassing from the solder joint 26

Table 1 – Combination of soldering processes with vacuum 10
Table 2 – Molar mass 17
Table 3 – Combination of soldering processes with vacuum 19

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ENVIRONMENTAL TESTING –

Part 3-15: Supporting documentation and guidance – Vacuum-assisted reflow soldering

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IEC TR 60068-3-15 has been prepared by technical committee 91: Electronics assembly technology. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
91/1916/DTR	91/1930/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60068 series, published under the general title *Environmental testing*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

As defined in ISO 857-2, reflow soldering is a joining process using an additional metal (solder) with a liquidus temperature of 450 °C or less, in which solder paste or preforms are reflowed.

Reflow soldering can be carried out with the technical processes of convection (air or nitrogen), condensation (vapour phase), radiation (e.g. infrared) or contact heat.

Sometimes it is not possible to achieve the required void level for an assembly only with methods listed above despite the use of all technical possibilities.

Regarding void-induced asymmetrical stress constellations, a reduction of voiding can lead to a mitigated stress condition within the solder joints.

Various technical requirements only tolerate very small void dimensions. To achieve these requirements, vacuum-assisted soldering can be applied with the above mentioned reflow soldering processes.

In some product applications, a hermetic seal is required. The reliable fulfilment of this requirement is very demanding to the process technology especially complex assemblies. Vacuum-assisted soldering creates significantly more consistency in the results here.

Further benefits of vacuum-assisted soldering are improved thermal management or high frequency performance (contour adaptation, mitigation of blow holes).

Vacuum-assisted soldering, however, requires a different equipment with more complex structure and process control. Since the vacuum process has an impact on the process time, the suitability of the components and solder paste that are used need to be checked.

ENVIRONMENTAL TESTING –

Part 3-15: Supporting documentation and guidance – Vacuum-assisted reflow soldering

1 Scope

This part of IEC 60068 describes vacuum-assisted soldering considering the thermal profiling, soldering methods, suitability of the components and vacuum features of soldering systems. It is based on practical experiences from manufacturers, component, material, and soldering systems suppliers. It supports manufacturers by providing information about the functionality of vacuum and effect of vacuum on components performance.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

4 Voids in solder joints

4.1 Type of voids

After soldering, many different macro and micro disturbances of the solder structure can be detected in the solder joints with e.g. X-Ray inspection, ultrasonic inspection or cross sectioning. Some of them represent the so-called voids which are divided according to their causes and type.

The definitions and classification of different void types can be found for example in IPC-7095, IPC-7093 or IEC TR 61191-8. This document describes the use of vacuum to prevent so-called macro voids. Figure 1 shows examples of macro voids in solder joints of different component types.