PD IEC/TS 62878-2-1:2015

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Device embedded substrate

Part 2-1: Guidelines — General description of technology

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TECHNICAL SPECIFICATION

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Device embedded substrate – Part 2-1: Guidelines – General description of technology

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DEVICE EMBEDDED SUBSTRATE –

Part 2-1: Guidelines – General description of technology

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Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62878-2-1, which is a Technical Specification, has been prepared by IEC technical committee 91: Electronics assembly technology.

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

Enquiry draft	Report on voting
91/1142/DTS	91/1163A/RVC

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

A list of all parts in the IEC 62878 series, published under the general title *Device embedded substrate*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This part of IEC 62878 provides guidance with respect to device embedded substrate, fabricated by embedding discrete active and passive electronic devices into one or multiple inner layers of a substrate with electric connections by means of vias, conductor plating, conductive paste, and printing. Within the IEC 62878 series,

- IEC 62878-1-1 specifies the test methods,
- IEC TS 62878-2-1 gives a general description of the technology,
- IEC TS 62878-2-3 provides guidance on design, and
- IEC TS 62878-2-4 specifies the test element groups.

The device embedded substrate may be used as a substrate to mount SMDs to form electronic circuits, as conductor and insulator layers may be formed after embedding electronic devices.

The purpose of the IEC 62878 series is to achieve a common understanding with respect to structures, test methods, design and fabrication processes and the use of the device embedded substrate in industry.

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DEVICE EMBEDDED SUBSTRATE –
Part 2-1: Guidelines – General description of technology

1 Scope

This part of IEC 62878 describes the basics of device embedding substrate.

This part of IEC 62878 is applicable to device embedded substrates fabricated by use of organic base material, which include for example active or passive devices, discrete components formed in the fabrication process of electronic wiring board, and sheet formed components.

The IEC 62878 series neither applies to the re-distribution layer (RDL) nor to the electronic modules defined as an M-type business model in IEC 62421.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60194, *Printed board design, manufacture and assembly – Terms and definitions*

IEC 61189 (all parts), *Test methods for electrical materials, printed boards and other interconnection structures and assemblies*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60194 apply.

3.2 Abbreviations

BGA	ball grid array
I/O	in/out
IPD	integrated passive device
LGA	land grid array
LTCC	low temperature co-fired ceramic
MEMS	micro electro mechanical systems
PoP	package on package
QFN	quad flat no-lead package
QFP	quad flat package
SMD	surface mount device
SOJ	small outline J-leaded package
WLP	wafer level package

4 Technology of device embedded substrate

4.1 Basic structures

Figure 1 shows an example of device embedding structures in the fabrication process of a device embedded substrate. Active and passive devices are connected to each other by interlayer vias and/or conductor patterns. Insulating layers are formed using insulating materials

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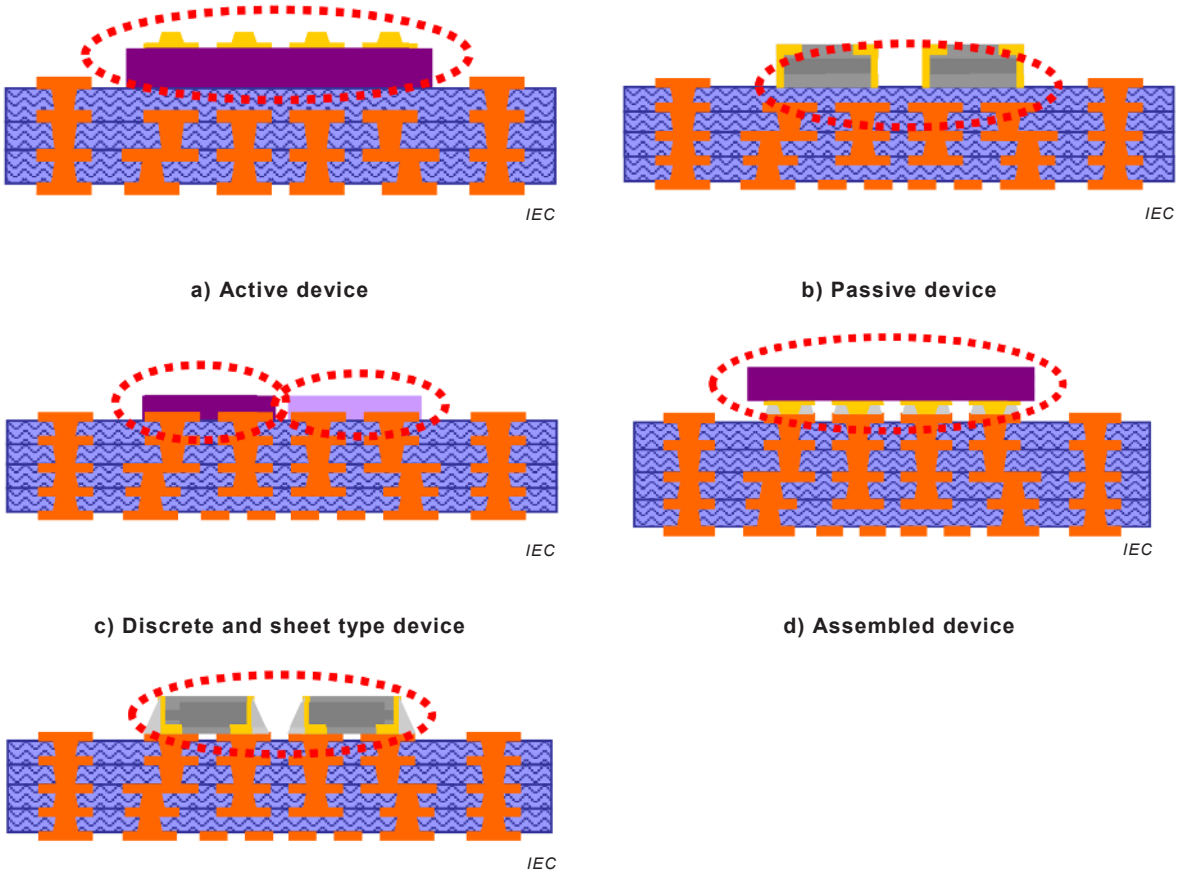
with vias for connection of inside conductor patterns to the conductor patterns formed on the surface(s) of the substrate. Figure 2 shows the substrate with connections using pads. Figure 3 shows the board using via connections.

The insulating layer includes rigid and flexible insulating resins such as phenol resin, epoxy resin, polyimide resin and modified polyimide resin, which may be reinforced with glass cloth, aramid cloth or paper. Interconnections include conventional interconnections to terminals of an embedded device and to a land for SMD, and formation of terminals by copper plating or vias using conductive paste.

This part of IEC 62878 does not specify a specific fabrication process of a device embedded substrate, via diameter/land diameter, conductor width/conductor spacing or a conductor line density.



a) Active device

b) Passive device

c) Discrete and sheet type device

d) Assembled device

e) Passive device

Figure 1 – Examples of device embedded substrate

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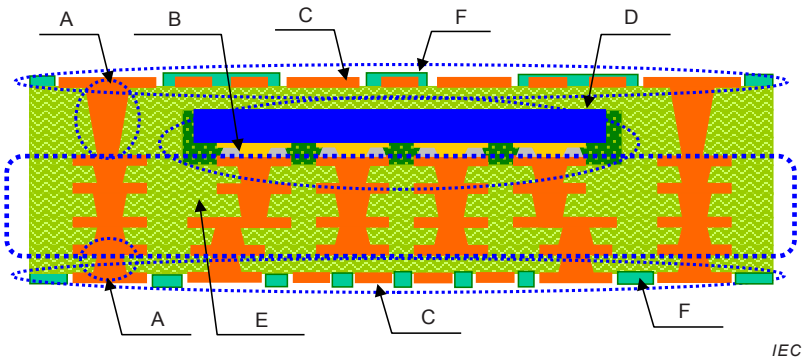
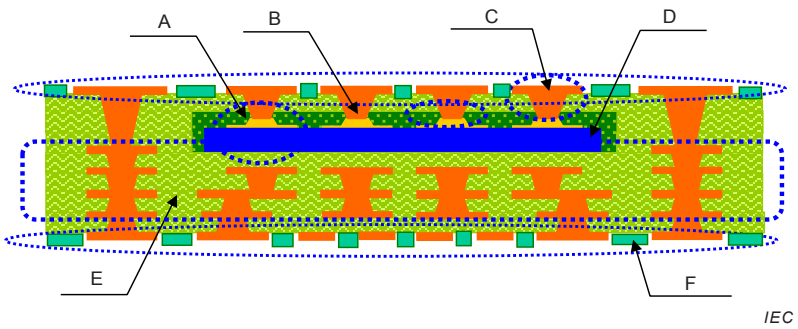


Key

A	Layer connection (via)
B	Solder connection
C	Pattern formation
D	Embedded active device
E	Base
F	Solder resist

Figure 2 – Completed device embedded substrate (pad connection)



Key

A	Embedded with terminals upward
B	Copper plated connection
C	Copper plated via
D	Embedded active device
E	Base
F	Solder resist

Figure 3 – Completed device embedded substrate (via connection)

4.2 Technology of device embedded substrate

There are two types of device embedded substrates. One type consists of mounting active and/or passive devices on a base substrate, then covering with organic resin; the other type consists of forming a device on a substrate and then covering it with organic resin.

Figure 4 shows the structure of a pad connection type substrate in which the active device is connected by pad onto the passive device embedded ceramics base. The device embedded substrate also includes composite type substrates which consist of mass produced inorganic

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