International standards affecting embedding technology

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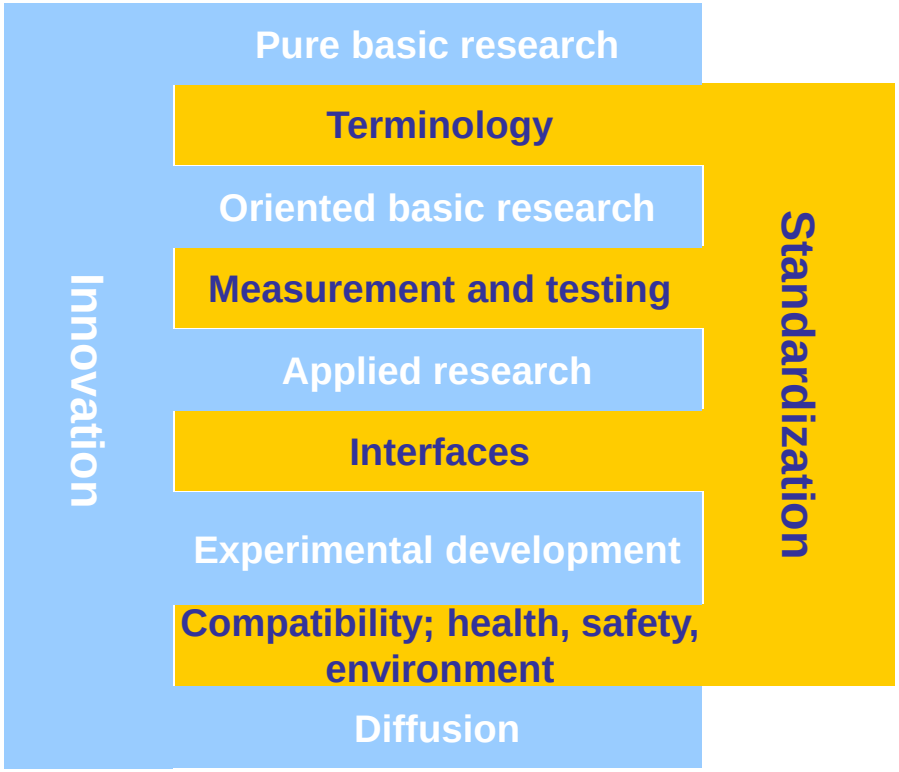
Innovation & Standardization

- Identify stakeholders, scope and propose architectures, road-maps,
- Plan and organize the standardization activities in the area under consideration,
- Mapping of closely related system activities to clearly position the expected new systems work



[Source: Blind and Gauch 2009]

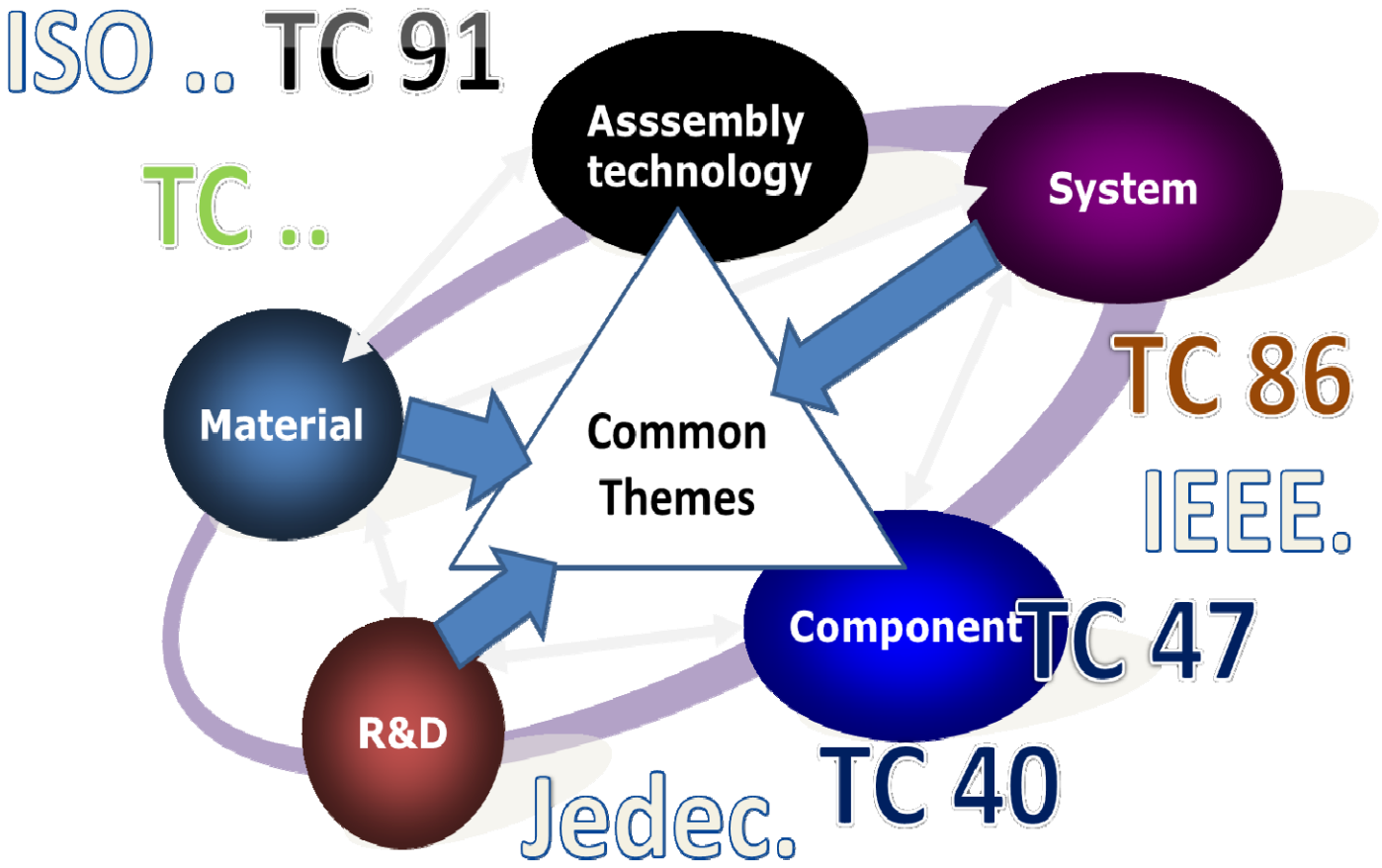
Support by standardization bodies

- **Fundamental standards** which concern terminology, conventions, signs and symbols, etc.;
- **Safety standards,** which prescribe mandatory requirements
- **Test methods and analysis standards** which measure characteristics such as temperature or chemical composition;
- **Specification standards** which define the characteristics of a product (product standard) or a service (service activities standard) and their performance thresholds such as fitness for use, interface and interchangeability, health and safety, environmental protection, etc.;
- **Organisation standards** which describe the functions and relationships of a company, as well as elements such as quality management and assurance, maintenance, value analysis, logistics, project or systems management, production management, etc. [1]
- **Guidelines** which describe for example design rules and manufacturing methods

Important – what is not the subject of "standardization" !

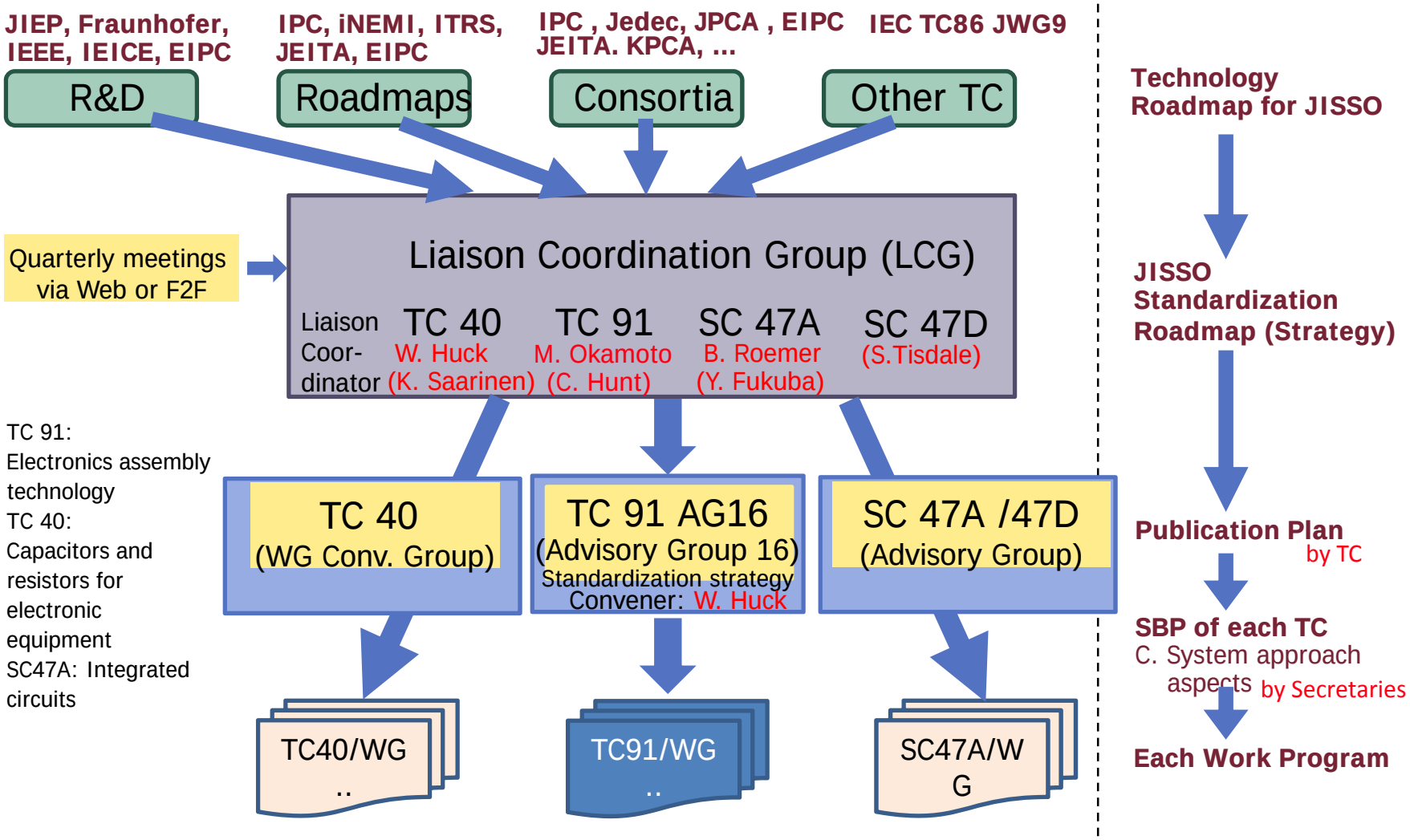
- ***Technology***
- ***Manufacturing***

Stakeholders



2014-12-05
M. Okamoto
2015-04-15
B. Roemer
2016-01-13
W.Huck

Established Working Structure



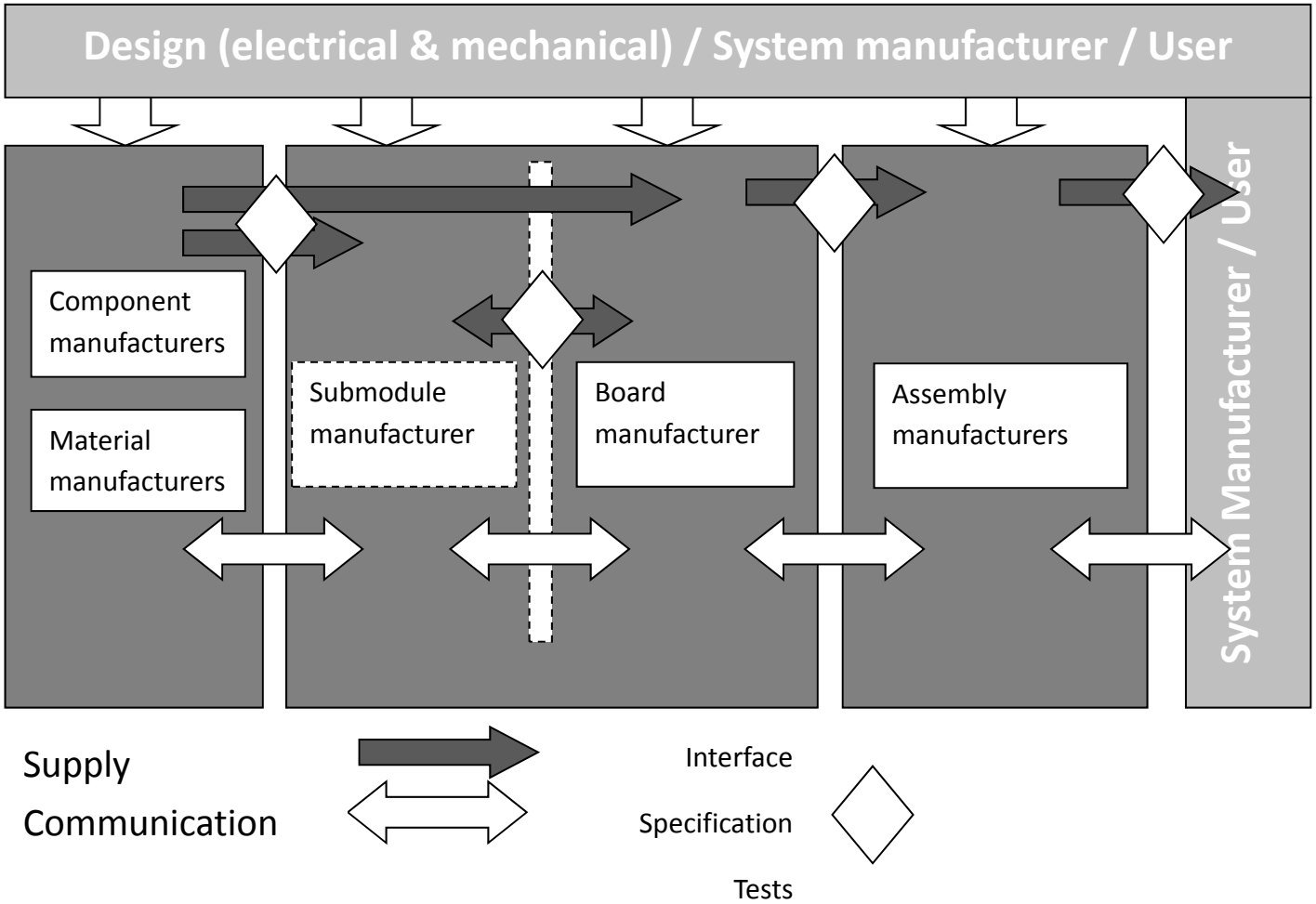
Embedding technology

Pilot for cooperation

To enable that above described communication and to define the interfaces the IEC TC 91 committee currently is publishing a set of documents related to embedding technology:

IEC 62878 Device embedded substrate

Embedding technology – Value chain



IEC 62878 Series – Published Standards

Reference	Date	Title	Description
IEC 62878-1-1:2015	2015-05-20	Device embedded substrate - Part 1-1: Generic specification - Test methods	IEC 62878-1-1:2015 specifies the test methods of passive and active device embedded substrates. The basic test methods of printed wiring substrate materials and substrates themselves are specified in IEC 61189-3. 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.
IEC TS 62878-2-1:2015	2015-03-30	Device embedded substrate - Part 2-1: Guidelines - General description of technology	IEC TS 62878-2-1:2015 describes the basics of device embedding substrate. It 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.
IEC TR 62878-2-2:2015	2015-12-04	Device embedded substrate - Part 2-2: Guidelines - Electrical testing	IEC TR 62878-2-2:2015 describes the necessary information on electrical testing for device embedded substrate. This includes the interconnection open- and short-circuit tests as well as the device functional test. It also provides guidelines by demonstrating the electrical test for device embedded substrate.
IEC TS 62878-2-3:2015	2015-03-27	Device embedded substrate - Part 2-3: Guidelines - Design guide	IEC TS 62878-2-3:2015 describes the design guide of device embedded substrates. The design guide of device embedded substrate is essentially the same as that of various electronic circuit boards. This part of IEC 62878 enables a thorough understanding of circuit design, structure design, board design, board manufacturing, jisso (assembly processes) and tests of products. It 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.
IEC TS 62878-2-4:2015	2015-03-27	Device embedded substrate - Part 2-4: Guidelines - Test element groups (TEG)	IEC TS 62878-2-4:2015 describes the test element group devices useful when measuring basic properties of device embedded substrates. It 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.
IEC PAS 62878-2-5:2015	2015-08-05	Device embedded substrate - Guidelines - Data format	IEC PAS 62878-2-5:2015(E) defines the data format for active and passive devices embedded inside an organic board whose electrical connections are made by means of a via, electroplating, conductive paste or printing of conductive material. This PAS describes the expression of 3D data information, the concept of layers, the structure of board data, and definitions of information repeatedly used in design.

IEC 62878 Series – Drafts

IEC 62878-1: Device embedded substrate – Generic specification

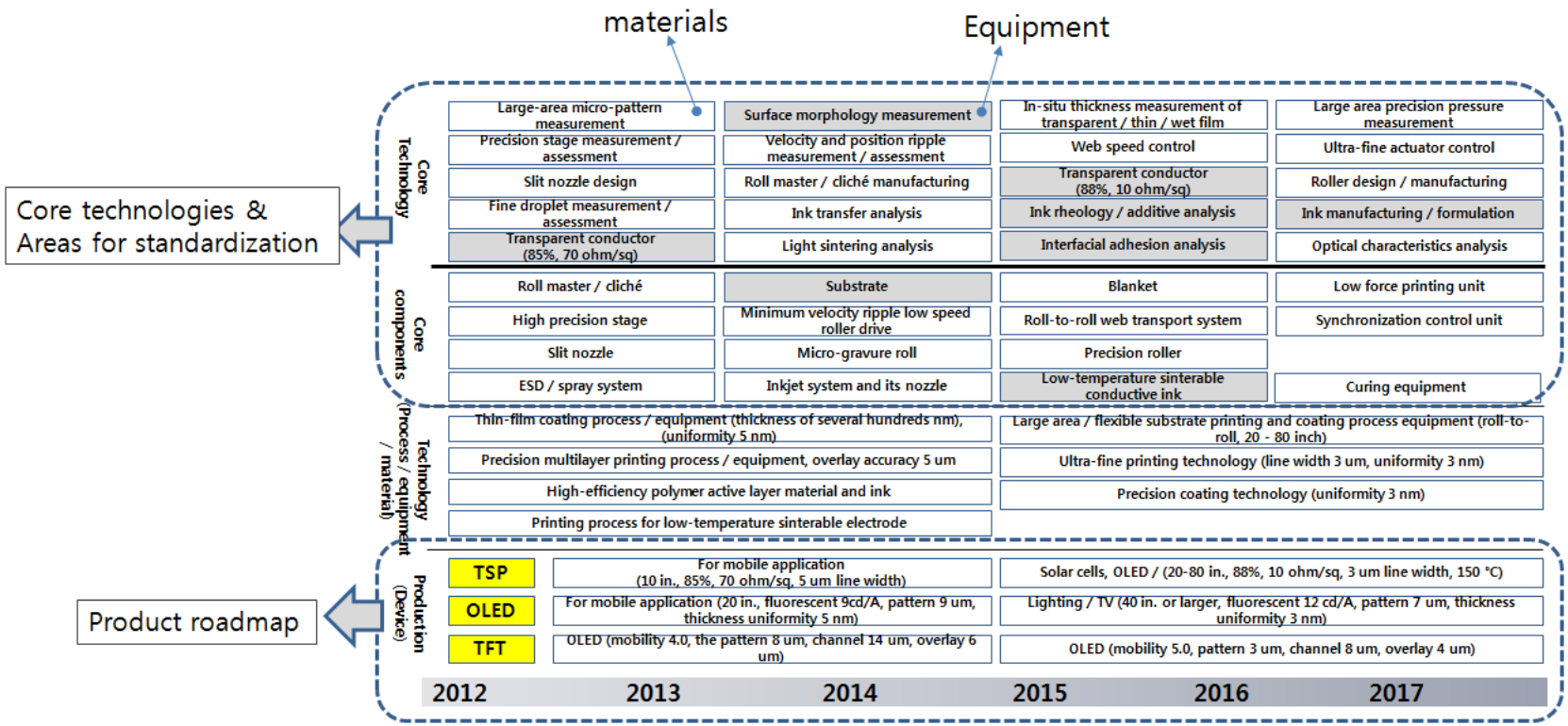
In this project electronic component manufacturers, board fabricators and users cooperate to establish a framework covering hardware embedding as a total. In this project for the first time different IEC Technical Committees are involved to produce a joint output.

IEC TC 91 WG6

Panel Level Packaging (PLP) is identified as a potential new work item, but still some clarification is needed:

- Panel Level Packaging is a process technology;
- The output – a “package“ – is a device, which can be an electronic component or module;
- Important to differentiate, whether an activity addresses:
  - The process and the requirements to materials and elements to be embedded, manufacturing technology, etc.
  - The product itself and the requirements to the product
- These aspects need to be considered for setting a standardization roadmap

Example from IEC TC 119 – Printed Electronics

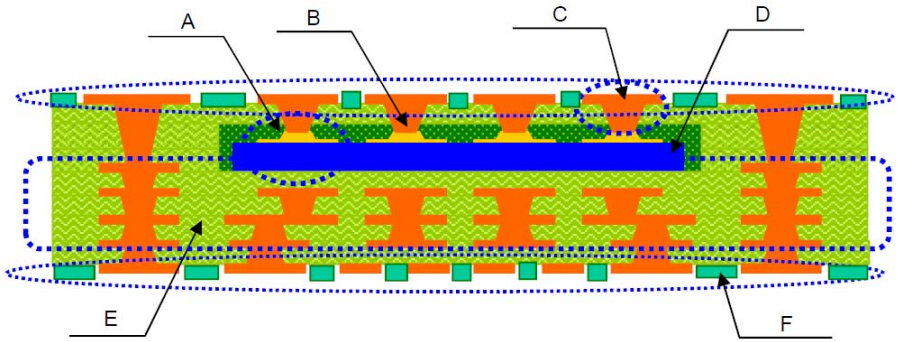


Device embedded module

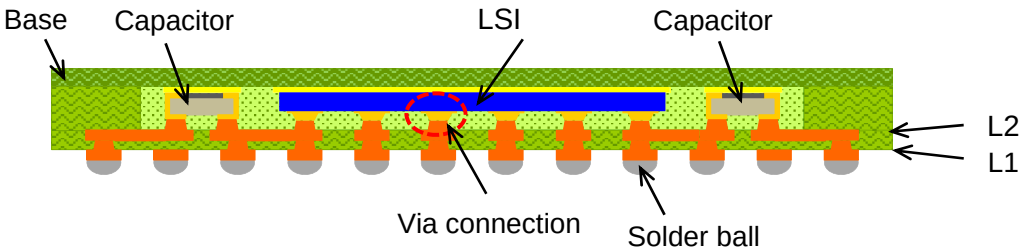
- Cheap and reasonable package that will dominate the market in future
- Panel Level Package (PLP) included
- Similar to BGA fan-out package
- Fabricated by device embedded substrate process
- Sheet structure
- Multi-chip and decoupling capacitors embedded
- Dicing after final test and shipping

Definition

- Device embedded substrate



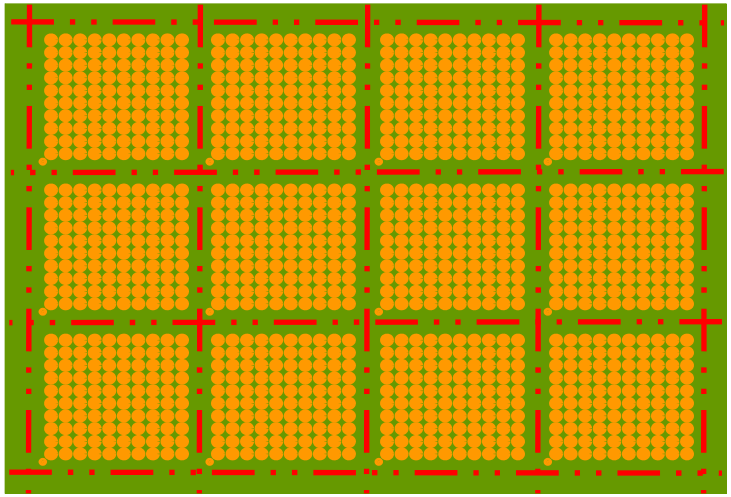
- Device embedded module



- JPCA Standard UB01

Joint work item

- Working group
  - Japan
  - Korea
  - Germany
  - England
  - Taiwan
  - US
- Structure
  - Similar to BGA
  - Fabricated by PCB process
- Test method
  - Basic rule except know-how
  - Panel test



Panel structure

How it could work

R&D projects identifiy needs

- terminology
- test methods
- metrology
- material specifications
- manufacturing specifications
- interfaces
- interoperability
- ....

Consortium / Steering committee

- evaluates needs
- identifies relevant stakeholders
- establishes a working platform
- develops roadmaps and project plans
- controls and supports realization

„Standardization bodies“

- prepare deliverables
- promote implementation
- prepare training where necessary

Next Steps

- Define Work Packages (Thrusts)
- Inputs from Steering Committee
- Coordinated activities with standardization group
- Set up a publication plan

Standardization group

- IEC TC91 WG6
  - DKE K682.0.5
  - BSI EPL 501
- …..

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