Webinar
ECT Best Practice: How to handle a PCB project with embedded components?
How to handle a PCB project with embedded components?

- Basic Motivation
- Brief overview of technologies to embed discrete components
- Possible components
- Conceptual phase and layer constructions
- Design & layout
- Summary
How to handle a PCB project with embedded components?

**Basic Motivation**

- Brief overview of technologies to embed discrete components
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Embedded Component Technology – ECT

Advantages of „buried“ components?

Miniaturization

- Package replacement
- Space savings of assembly area on the outer layers

Performance/Function

- Integrated shielding
- Short signal paths
- Protection against plagiarism

Reliability

- Protected against influences
- Secure fixing
- Thermal management
How to handle a PCB project with embedded components?

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Summary
Embedded Component Technology – ECT
ECT–µVia: Embedded active and passive devices

ECT–µVia Manufacturing

Assembly (Gluing/Sintering/Soldering)

Multilayer pressing

Drilling of vias and microvias
Non-plated microvia on embedded capacitor with Cu termination

length: 58.97 µm

length: 21.96 µm
Embedded Component Technology – ECT
ECT-µVia: Embedded active and passive devices

ECT-µVia Manufacturing

- Assembly (Gluing/Sintering/Soldering)
- Multilayer pressing
- Drilling of vias and microvias
- Plating and structuring
Embedded Component Technology – ECT
ECT-µVia: Embedded active and passive devices

Plated Microvia on embedded capacitor with Cu termination
Embedded Component Technology – ECT
ECT–Flip Chip: Embedded active devices

ECT-Flip Chip Production

Core with footprint for Flip Chip

Assembly (Flip Chip – ACA)

Multilayer pressing

Remaining PCB processes
How to handle a PCB project with embedded components?

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Summary
## Availability of components

### Passive Components with Cu-Termination

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<tr>
<th>Component</th>
<th>Mounting Form</th>
<th>Thicknesses</th>
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<tbody>
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<td>Capacitors</td>
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### Bare Die Silicon ICs with process compatible pads

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<th>Pads Type</th>
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<td>ECT–µVia Pads</td>
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<td>ECT–Flip Chip Pads</td>
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How to handle a PCB project with embedded components?

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Summary
Very close collaboration is needed at a very early stage in the concept and design phase to be successful.
### BOM – Analysis of an existing predecessor-layout (if available)

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Embedded Component Technology – ECT
Analysis of existing boards with regard to usability of embedded components

BOM – Analysis of an existing predecessor-layout (if available)

- Embeddable Components identified in BOM
Embedding of active and passive components:

Initial meeting

Final implementation
How to handle a PCB project with embedded components?

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Design & layout

Summary
EDA-Tools for ECT:
The latest versions of these tools:

- **Altium Designer**
- **Cadence Allegro® PCB Designer**
- **Mentor Graphics® xpedition**
- **ZUKEN CR-8000**

Further tools possible, but with limitations.
EDA-Tools for ECT:
Main differences between these tools

ECT capable tools:
- Central part libraries, footprints may be moved to any Layer of the layout
- 3D Design Rule Check including mechanical checks

ECT incapable tools:
- Application specific part library, same layer stack for library and application board with footprint on dedicated layer
- Only 2D Design Rule Check, no Z-axis-check
Embedded Component Technology – ECT
Design Rules ECT–μVia and ECT–Flip Chip

**pad Ø**
- 175 µm

**end Ø**
- 70 µm

**component height**
- ≥ 150 µm
- (<150 µm upon request)

**dielectric thickness**
- 20 – 25 µm
- ≥ 50 µm

**pitch**
- ≥ 250 µm

**distance**
- pad / pad ≥ 75 µm
- next component ≥ 300 µm
- chip / sidewall ≥ 500 µm
- pad / pad ≥ 75 µm
- next component ≥ 300 µm
- chip / sidewall ≥ 500 µm

**pad metallization**
- ≥ 6 µm Cu or
- ≥ 5 µm Ni + flash Pd

**embedded component**
- ≤ 5 mm x 5 mm

**adhesive**
- ACA / NCA / ESC (Encapsulated Solder Connection)

**backside contact (microvia or ICA) available upon request**

**dielectric thickness**
- ≥ 50 µm

**pad Ø**
- ≥ 125 µm

**distance**
- pad / pad ≥ 75 µm
- next component ≥ 300 µm
- chip / sidewall ≥ 500 µm
- pad / pad ≥ 75 µm
- next component ≥ 300 µm
- chip / sidewall ≥ 500 µm

**embedded flip chip**
- ≤ 5 mm x 5 mm

**adhesive**
- ACA / NCA / ESC (Encapsulated Solder Connection)
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How to handle a PCB project with embedded components?

Summary

- Different technologies possible
- Components must meet certain conditions
- Würth Elektronik already provides support during conceptual phase for
  - layer constructions,
  - design and
  - layout

Jürgen Wolf
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Product Manager
Embedded Component Technology