IPC-2292

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Design Standard for Printed Electronics on Flexible Substrates

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Design Standard for Printed Electronics on Flexible Substrates

Developed by the D-61 Printed Electronics Design Subcommittee of the D-60 Printed Electronics Committee of IPC

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

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DESIGN STANDARD FOR PRINTED ELECTRONICS ON FLEXIBLE SUBSTRATES

1 SCOPE

This standard establishes specific requirements for the design of printed electronic applications and their forms of component mounting and interconnecting structures on flexible substrates. Flexible substrates, as pertain to this standard, are materials or devices which have some amount of flexibility or bendability (not rigid) but are not considered to be stretchable (e.g., fabrics, textiles, stretchable polymers, etc.).

1.1 Printed Electronics Types Any printed electronics design will be incumbent on requirements from the customer, materials to be used and the printing processes. The following printed electronics types represent the known variations of printed electronics. These types cover all known processes for printing electronics (e.g., screen, aerosol, 3D, etc.). As other types or printing processes are made known, they will be added to this standardized list of types.

The printed electronics type **shall** be specified on the procurement document as agreed upon between user and supplier (AABUS). If the printed electronics type is not designated below, a unique type designation will be used.

- *Printed electronics — Type 1: Using printed electronics processes on a planar substrate*
- *Printed electronics — Type 2: Using printed electronics processes on a nonplanar substrate*
- *Printed electronics — Type 3: Using printed electronics processes to fully build and functionalize a device in a 3D space (no starting substrate)*

1.2 Standard Printed Electronics Design (SPED) Classifications Standard print electronics design (SPED) types **shall** be in accordance with 1.2.1 through 1.2.3. For purposes of explanation, a basic variation of each SPED is shown in 1.2.1 through 1.2.3.

Each IPC-2292 SPED consists of the following components:

- *Substrate* — Any flexible nonconductive and/or conductive (e.g., flexible printed board or other manufactured functional part) material
- *Printed element* — Any conductive, semiconductive or dielectric material applied using additive/printing processes
- *Surfaces* — Top and bottom sides of the substrate
  - First surface is top
  - Second surface is bottom

Each additive process required to manufacture the finished flexible printed electronic is identified by an alphanumeric designation. The letter F (first/top surface) or S (second/bottom surface) indicates the side of the substrate. The number indicates the print/process step.

For example:

F1 = first print on the first/top surface

F2 = second print on the first/top surface

S1 = first print on the second/bottom surface

S2 = second print on the second/bottom surface

It is important to note that the print/process step numbers can be repeated on each side, because the numbers only apply to printing elements on a specific side.

1.2.1 Standard Printed Electronic Design (SPED) 1 SPED 1 has printed element(s), which can include vias between printed conductive elements, on one or both surfaces of a substrate. SPED 1 does not have electrical/electronic interconnections from printed element(s) to the substrate.