

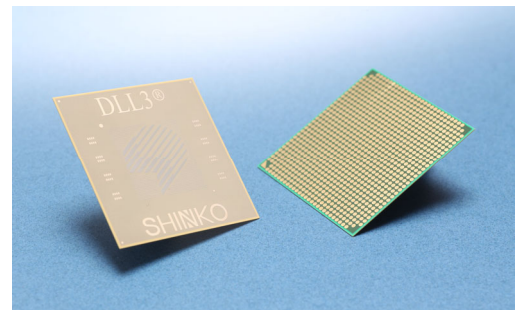
## SHINKO Coreless Substrate DLL3<sup>®</sup> in High Volume Production

SHINKO has started volume production for DLL3<sup>®</sup>. (DLL3<sup>®</sup> is SHINKO's trade mark.) DLL3<sup>®</sup> is one of the options for organic substrates which is able to offer design flexibility, enhanced electrical performance and thinner substrate thickness. SHINKO has been receiving various requirements from the semiconductor market and DLL3<sup>®</sup> is expected to adapt to a variety of these requested applications.

### 1. DLL3<sup>®</sup>

#### 1-1 Structure

SHINKO build-up substrates are referred to as DLL<sup>®</sup>. These substrates are manufactured by alternately forming insulator layers and copper plated circuit layers (build-up layers) simultaneously on both sides of core layer which is made of resin and glass cloth. Every insulator layer has laser formed micro vias to electrically connect the copper circuit layers on each side of the insulator layer. In addition, the core layer has numerous mechanically drilled and copper plated through holes to electrically connect the top and bottom sides of the core to the build-up layers. The DLL3<sup>®</sup> coreless substrate is an organic substrate which is produced by using only build-up layers.



Coreless Substrate DLL3<sup>®</sup>

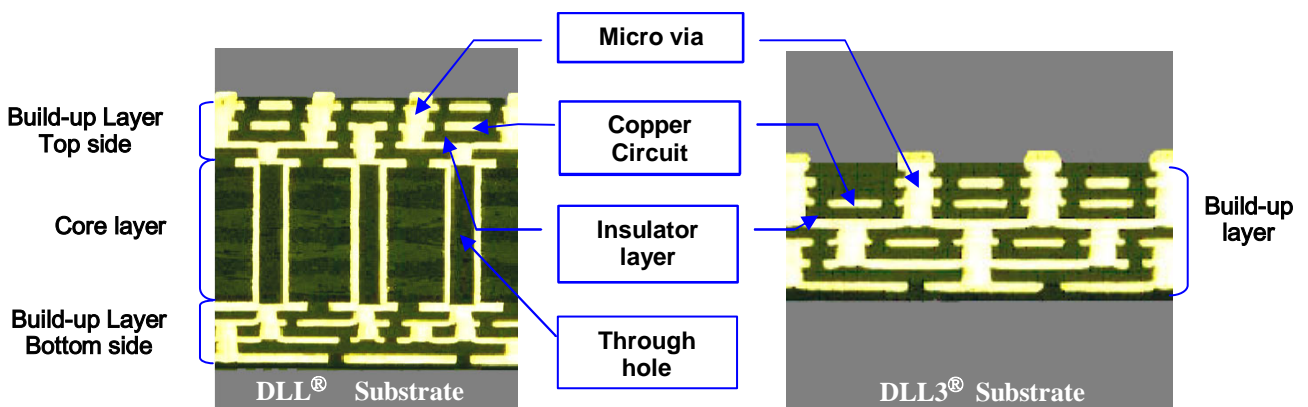


Fig. Cross section of DLL<sup>®</sup> & DLL3<sup>®</sup>

## 1-2 Features

### 1-2-1 For design and function

- Design flexibility due to no limitation of through hole location and wiring.
- Increase of wiring density.
- Thinner substrate thickness.
- Increase electrical performance by low loop inductance.

### 1-2-2 Material structure

- Simple material sets compared to DLL<sup>®</sup>. (insulator and copper circuit layers, solder-mask and solder.)
- Uses common DLL<sup>®</sup> material selections with much reliability data.

### 1-2-3 Manufacturing process

- No need to process core layer (through-hole drilling, through-hole Cu plating, plugging, etc.).
- Common use of major production equipment except for a few special processes.

## 2. Development progress

- DLL3<sup>®</sup> R&D started in 2000.
- DLL3<sup>®</sup> development and prototype production started in 2004.
- Low volume production started in 2008.
- High volume production started in 2010.

## 3. Target Application

- Consumer
- High-end ASIC
- MPU, Memory, and Module (smaller and thinner structure)

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