SAND2009-5204P

Thin Flex Circuits

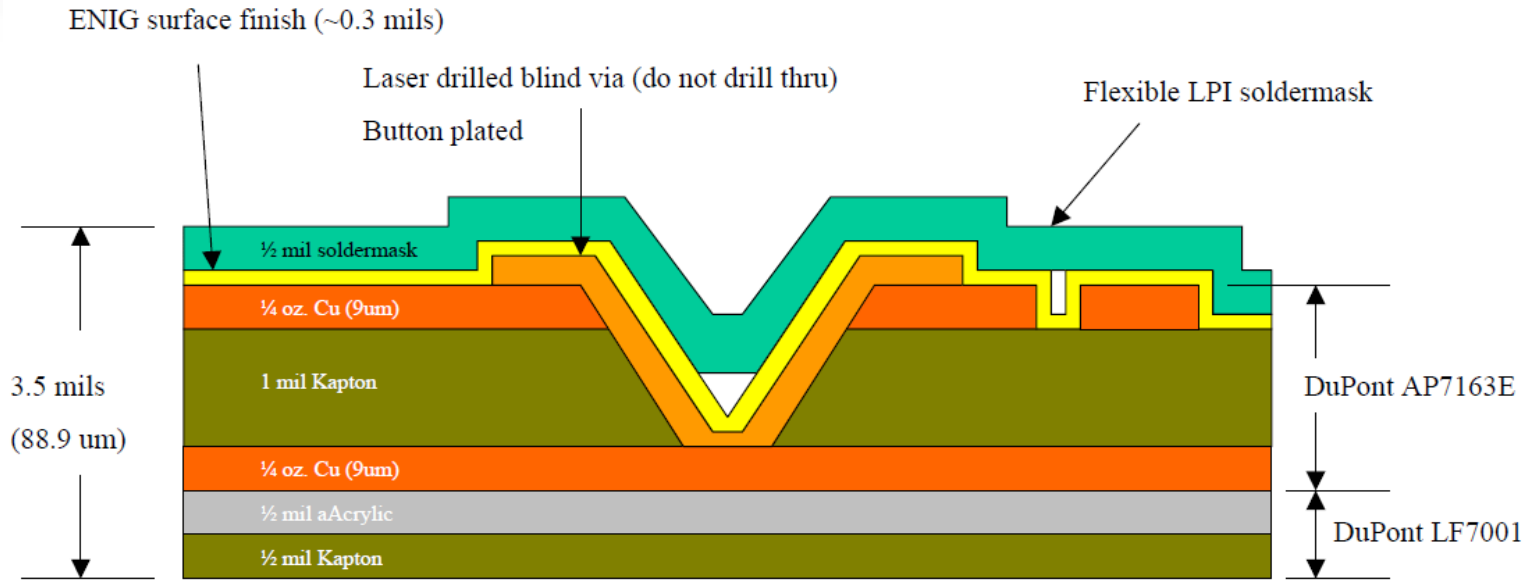
Dahwey Chu

Advanced Microsystems Packaging, Department 1715
Sandia National Laboratories
Albuquerque, NM 87185-0352

August 13, 2009
Albuquerque, NM

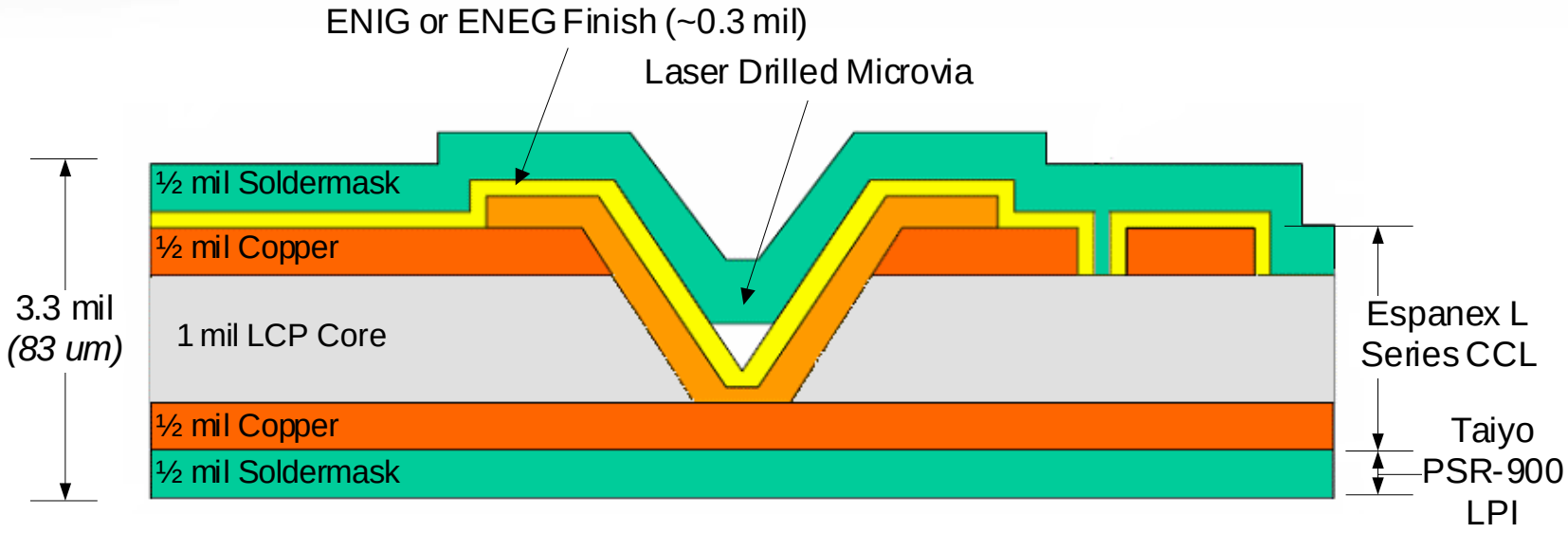
Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000

Initial Ultra Thin Flex Board



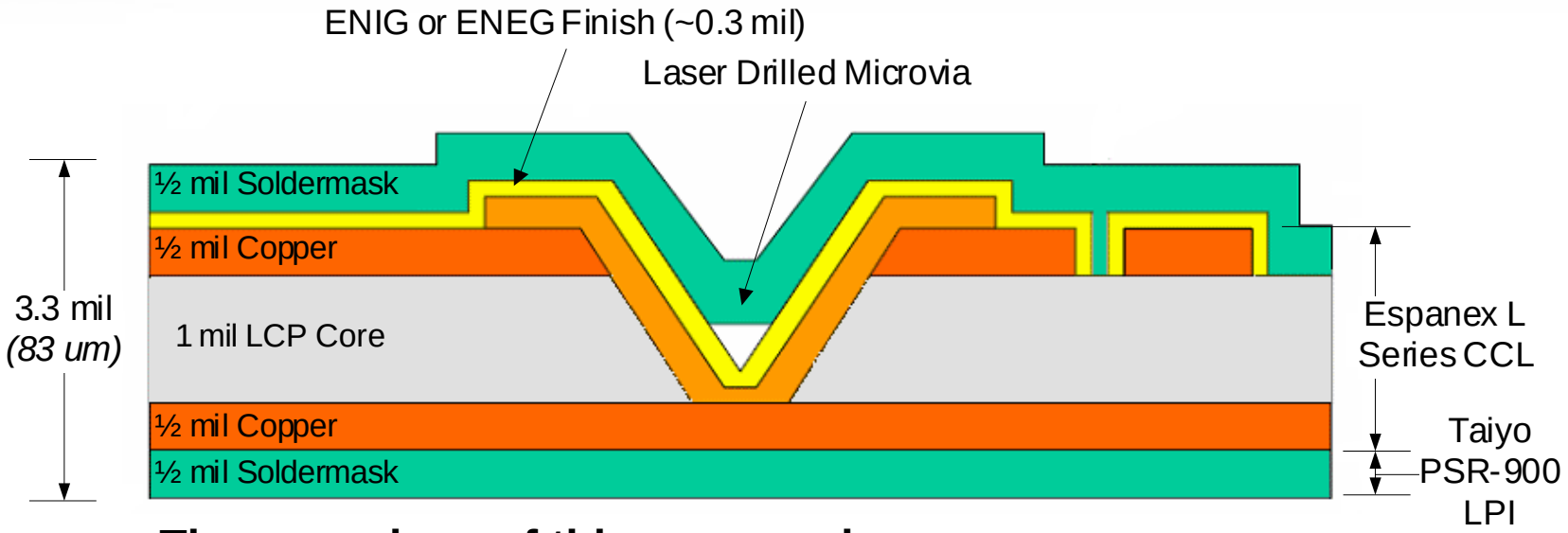
- **~ 89 um thick board**
- **ENIG – Electroless Nickel Immersion Gold surface finish**
- **100 um microvias connected the metal layers vertically allowing for very dense circuitry**
- **75 um conductor lines and 75 um minimum spaces**
- **Surface mounted parts**
- **Chip and wire - using Aluminum wedge wire bonds**

LCP Core - Ultra Thin Flex Board



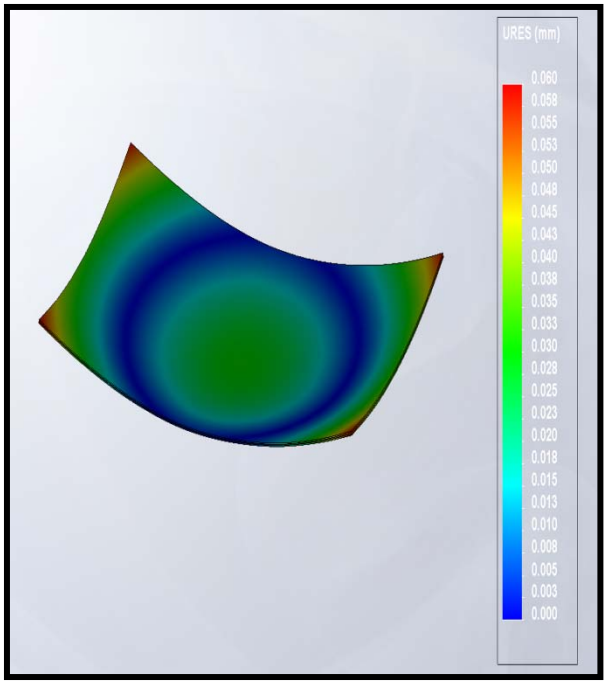
- **~ 83 um thick board, 100 um microvias, 75 um conductor lines and 75 um minimum spaces**
- **Needed to solidify the board to increase wire bondablity.**
- **Needed eliminate as many dielectric layers as possible in order to reduce height**
- **Eliminate the adhesive layers which absorb the vibration necessary to adhere the wire bonds to the bond pads**
- **Simplified the stack-up and used the soldermask to act as an electrical barrier and solder repellant when placing components**

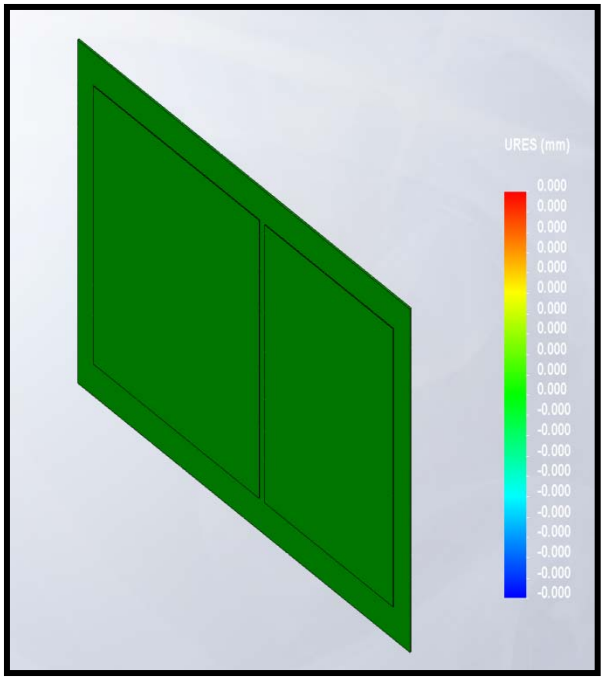
LCP Core - Ultra Thin Flex Board



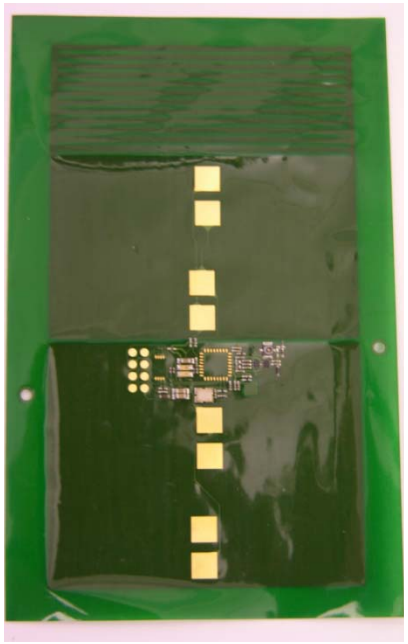
- **Three versions of this were made**
  - **Version 1 - ENIG finish use with Al wedge wire bonding**
  - **Version 2 - ENEG – Electroless Nickel Electroless Gold finish used with Gold ball wire bonding**
  - **Version 3 – Same board layout but incorporated 01005 passives**
- **All versions used LCP Core (more rigid and lower loss)**
- **This stackup created mechanical stresses**
- **All three version made were non-planer**

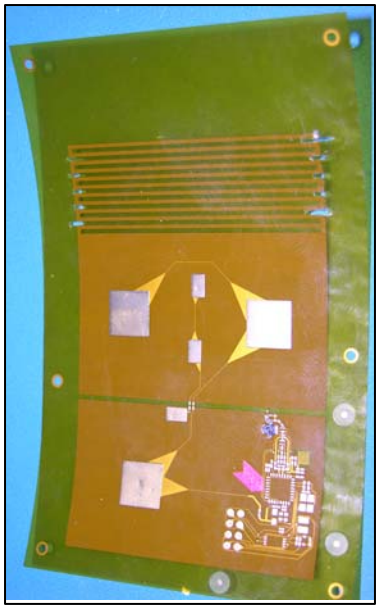
Mechanical Analysis - Ultra Thin Flex Board





LCP - Ultra Thin Flex Board





Ultra Thin Flex Board