

## IEEE Components, Packaging and Manufacturing Technology Society – OC Chapter Tuesday, June 4, 2013 Technical Meeting

### Recent Advances in Anisotropic Conductive Films (ACFs) Technology

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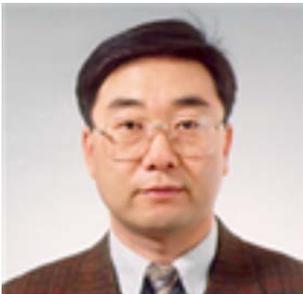
#### Abstract

Anisotropic Conductive Films (ACFs) have been widely used as interconnection materials in semiconductor and display applications for chip-on-glass (COG), flex-on-glass (FOG), flex-on-board (FOB), chip-on-flex (COF), chip-on-board (COB) due to their fine-pitch capability, simple process, and cost effectiveness. There have been many technical innovations in terms of materials and processing technologies. In this presentation, solder ACFs, nanofiber, photo-activated ACFs and 3D-TSV NCF materials will be presented as recent ACF materials innovation, and novel vertical ultrasonic bonding technique and wafer level ACF processing methods will be presented as recent ACF processing innovation.

For nanofiber ACFs, about 500 nm diameter polymer nanofibers with coupled conductive particles are fabricated using an electro-spinning method, and then ACFs with the nanofibers are successfully made by laminating NCFs (nonconductive films) on top and bottom side of the nanofibers. This novel ACF shows excellent electrical bump contact resistance and fine pitch handling capability. Nanofiber ACF can completely solve the electrical shortage problems at 7  $\mu\text{m}$  bump-to-bump gap and 20 micron ultra fine bump pitch of COG(Chip On Glass) and COF(Chip On Flex) electronic packaging applications.

Wafer level packages using pre-applied ACFs are also invented. After ACF pre-lamination on a bumped wafer, singulated chips are assembled on substrates using thermo-compression bonding. Wafer level assembled ACF joints showed excellent contact resistance, strong bump adhesion, and similar reliability behaviors compared with conventional ACF flip chip joints using thermo-compression bonding. The new wafer level packages using pre-applied ACFs can be used in many non-solder flip chip assembly applications such as COB (Chip-on-Board), COF (Chip-on-Flex), COG (Chip-on-Glass), and 3D-TSV. The non-conductive films (NCFs) or TSV NCFs, are applied on the wafer level before bonding so that it acts as both adhesive and underfill. Excellent SnAg bump joints were successfully formed with stable electrical interconnection by the added flux function at 40  $\mu\text{m}$  pitch 3D-TSV bump pitch.

#### Biography



After receiving his Ph.D. from Cornell University in 1989, Dr. Kyung W. Paik worked for General Electric from 1989 to 1995, where he was involved with R&D of materials and processes of GE High Density Interconnect (HDI) multichip module technology and power I/C packaging. In 1995, he joined the Korea Advanced Institute of Science and Technology (KAIST) as a professor in the Materials Science and Engineering Department, serving as VP of Research from 2011 to 2013. In his Nano-Packaging and Interconnect Laboratory (NPIL), he currently works on Anisotropic Conductive Adhesives (ACAs) materials and processing, 3-D TSV interconnect materials, solders, and MEMS & display packaging technologies. Professor Paik has published more than 150 SCI journal papers and has about 40 issued and pending US patents. He is a member of IEEE-CPMT, IMAPS, and SEMI and has been involved in numerous international electronic packaging conferences such as ECTC, IMPACT, EMAP, and EPTC, from invited speaker and international liaison, to organizer, chair, and technical committee member.

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Date: **Tuesday, June 4, 2013**  
Location: **Broadcom Corporation, 5300 California Ave., Irvine, CA 92617 – Bldg. 2 Conf. Room 2-1037 Salt Creek**  
Check in at the Security Gate and proceed to Bldg. 2. You will be escorted into the building.  
Time: **5:30-6:00pm: Social time, 6:00-7:00pm: Presentation, 7:00pm: Dinner (free for attendees!)**  
RSVP: **IEEE members and non-members all are welcome to attend. Please RSVP at <http://tinyurl.com/oueh59t>.** Please be at the Bldg. 2 entrance by 6:00 pm; no escorts after that. For questions regarding RSVP, please contact Cristina Nicoara ([cnicoara@broadcom.com](mailto:cnicoara@broadcom.com)).

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