2012 35th IEEE/CPMT International Electronics Manufacturing Technology Conference

(IEMT 2012)

Ipoh, Perak, Malaysia
6-8 November 2012

IEEE Catalog Number: CFP12IEU-PRT
ISBN: 978-1-4673-4384-8

TABLE OF CONTENTS

SINTERING OF AG80-AL20 NANOALLOY FOR HIGH TEMPERATURE DIE ATTACH APPLICATIONS ON SILICON CARBIDE- BASED POWER DEVICES: THE EFFECTS OF RAMP RATE AND DWELL TIME 1
Vemal Raja Manikam, Khairunisak Abdul Razak, Kuan Yew Cheong

INTERFACIAL REACTIONS BETWEEN SN-3.8 AG-0.7CU SOLDER AND NI-W ALLOY FILMS 6
C. S. Chew, A. S. M. A. Haseeb, Mohd. Rafie Johan

AN INVESTIGATION ON CU WIRE BOND CORROSION AND MITIGATION TECHNIQUE FOR AUTOMOTIVE RELIABILITY 12
C. T. Tai, H. Y. Lim, C. H. Teo, P. J. Audrey Swee

SYNTHESIS OF CUO NANOCOMPOSITES WITH VARIOUS MORPHOLOGIES VIA PULSED WIRE EXPLOSION 22
Shutesh Krishnan, A. S. M. A Haseeb, Mohd Rafie Johan

INTERFACIAL REACTIONS BETWEEN NI-ZN ALLOY FILMS AND LEAD-FREE SOLDERS 26
Pay Ying Chia, A. S. M. A. Haseeb

SOLDERING AND INTERFACIAL CHARACTERISTICS OF SN-3.5AG SOLDER CONTAINING ZINC NANOPARTICLES 32
Yee Mei Leong, A. S. M. A. Haseeb

MATERIAL ANALYSIS AND PROCESS CHARACTERIZATION OF SUPER HIGH THERMAL PERFORMANCE DIE ATTACH EPOXY TOWARDS PACKAGE RELIABILITY, THERMAL AND ELECTRICAL PERFORMANCE 38
H. T. Wang, K. B. Yeo

COPPER WIRE BOND ON MCM DEVICE (BOND STITCH ON BUMP BALL) 43
Tan Boo Wei, Niu You Hua

CHARACTERIZATION ON ULTRA LOW LOOP CU WIRE PROPERTY AND BEHAVIOR 46
Melissa Ng Mei Ching, Lee Chai Ying

HIGH RELIABILITY ENCAPSULANT LIQUID RESIN FOR SIP - THE SIMULTANEOUS PROCESS OF OVER MOLD AND UNDERFILL 52
Joji Yukimaru, Koichiro Nagai, Yuki Ishikawa

HARDWARE CHECKER MODULE 56
Michael O. Pahanel

BUILDING A BIPOLAR FLOATING POWER SUPPLY MODULE 59
Y. F. Chek, T. C. Liew

A COST EFFECTIVE METHOD TO TEST RF POWER ON THE ATE IN MANUFACTURING 63
Chek Yean Feng

CU BONDING DEVELOPMENT & CHALLENGES ON NIPD BOND PAD 66
Yuen Chun Soh, Chee Chian Lim, Tze Yang Hin, Chin Shung Teoh

PLASMA PROCESS CONSIDERATIONS FOR COPPER WIRE BONDING 71
Daniel Chir, Raymond Yeo

INVESTIGATION OF WETTING BEHAVIOR OF SN-3AG-0.5CU SOLDER PASTE TO BGA SOLDER BALL 74
Maryam Husna Yahya, Keisuke Nakamura, Ikuo Shohji

EFFECT OF NI, GE AND P ADDITION IN SN-AG-CU LEAD-FREE SOLDER ON SOLDER JOINT PROPERTIES WITH ELECTROLESS NI/AU ELECTRODES 79
Ikuo Shohji, Ryohei Arai

SOLDER BALL ROBUSTNESS STUDY ON POLYMER CORE SOLDER BALLS FOR BGA PACKAGES 84
Yap Boon Kar, Tan Cai Hui, Agileswari, Calvin Lo

INVESTIGATION OF SOLDER BRIDGING FAILURE FOR MOLDED MATRIX ARRAY PACKAGE 88
Kim Foong Chong, Shaw Fong Wong, Jenn Seong Leong

PAD BENDING IMPROVEMENT ON COPPER WIRE BONDING ON NIP/PD/AU BOND PAD 94
Tan Kian Heong, Teo Chen Kim, Wang Mei Yong

SOLDER EXTRUSION SOLUTION AND MOLD ADHESION TO DIE SURFACE IMPROVEMENT WITH PI ISOLATION DESIGN FOR FCOL EXPOSED DIE TECHNOLOGY 98
Teck Siang Lim, C. H. Cheong, S. H. Tan

SOLDER MICROSTRUCTURE AND INTERMETALLIC INTERFACE EVALUATION BETWEEN SN-3.5AG-1.0CU-XNI LEAD FREE SOLDER UNDER LONG TIME THERMAL AGING (X: 0, 0.05, 0.2, 0.5) 103
Noor Asikin Ab Ghani, Iziana Yahya, Mohd Arif Anuar Mohd Salleh, Saidatulakmar Shamsuddin, Ramani Mayappan

INTERMETALLIC EVOLUTION BETWEEN SN-3.5AG-1.0CU-XZN LEAD FREE SOLDER AND COPPER SUBSTRATE UNDER LONG TIME THERMAL AGING (X: 0, 0.1, 0.4, 0.7) 108
Iziana Yahya, Noor Asikin Ab Ghani, Mohd Arif Anuar Mohd Salleh, Hamidi Abd Hamid, Zainal Ariffin Ahmad, Ramani Mayappan

EFFECT OF ADDING POROUS CU ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF PB-FREE SOLDER JOINT 114
Nashrah Hani Jamadon, Farazila Yusof, Mohd Hamdi Abd Shukor

EXTENDING TESTER CAPABILITY BY USE OF PROGRAMMABLE-GAIN INSTRUMENTATION AMPLIFIER AS AN IC TEST SOLUTION 119
Francis T. L. Tan

RELIABLE ULTRA-LOW-LOOP BONDING APPROACH ON X2/X3 THIN QFN 123
S. H. Liew, W. L. Law

MOLD COMPOUND SELECTION STUDY FOR CMOS90 176 LEAD LQFP 24X24MM PACKAGE 128
Teng Seng Kiong, Ibrahim Ruzaini, Serene Teh Seoh Hian

TRANSPARENT MOLDING COMPOUND STUDY AND LEADFRAME DESIGN IMPROVEMENT FOR AMBIENT LIGHT AND PROXIMITY SENSOR PACKAGING 133
S. K. Chin, Eric Erfe

ROBUST POWER PACKAGE DEVELOPMENT WITH MECHANICAL SIMULATION AND RELIABILITY VALIDATION 140
Xueren Zhang, Kim-Yong Goh, Yiyi Ma, Wingshenq Wong

AUTOMATED ASSEMBLY LOT TRANSACTION 146
M. S. Tiong, Richard Tugay

SOFTWARE-BASED DEVELOPMENT OF 3D INTEGRATION FLOWS 148
Armin Gruewald, Kai Hahn, Rainer Brück

STRETCHING THE CAPABILITY OF INTEL DIRECT MATERIAL USABILITY (SHELF LIFE) 153
Naziana B. T. Mohd Nasir, Chee Kiat Tan

PRECISION DELAY MATCHING TESTING FOR GATE DRIVER ICS ON IFLEX™ TESTER PLATFORM 158
Bobby Lai, Roland Su

STUDY ON RELIABILITY TEST OF DIE ATTACH MATERIAL 163
Lim Chuan Yik, Yap Boon Kar, Nor Shafika

EFFECT OF AG ADDITION ON THE INTERMETALLIC COMPOUND AND JOINT STRENGTH BETWEEN SN-ZN-BI LEAD FREE SOLDER AND COPPER SUBSTRATE 170
Nor Aishah Jasli, Hamidi Abd Hamid, Ramani Mayappan

SENSITIVITY STUDY OF CHANNEL TERMINATION ON VERTICAL SIDE-CHIP INTERCONNECTION 174
Jackson Kong, Bok Eng Cheah, Ai Heong Tan

SUCCESS STORY IN DRIVING QUALITY ENHANCEMENTS IN THE INDIRECT MATERIALS USED IN ASSEMBLY/TEST ELECTRONIC PACKAGING MANUFACTURING 179
Dennis Prem Kumar Chandran, Ong Chee Teong, Mohd Jaffri Razai

CHARACTERIZATION OF MECHANICAL TESTING ON LEAD FREE SOLDER ON ELECTRONIC APPLICATION 180
M. N. Ervina Efzan, Amares Singh

FURTHER CHARACTERIZATION OF 2nd BOND IN BARE CU WIRE AND PD COATED CU WIRE ON VARIOUS LEADFRAME PLATING SCHEME 189
Loh Lee Jeng, Loh Kian Hwa, Ng Wen Chang

SIZE AND STRAIN EFFECT ON MINIATURE COPPER-SOLDER-COPPER JOINT 195
N/A

DEVELOPMENT OF ADVANCED FAN-OUT WAFER LEVEL PACKAGE (EMBEDDED WAFER LEVEL BGA) 196
S. W. Yoon, Yonggang Jin, Jerome Teysseyre, Anandan Ramasy Yun Liu

ENHANCED FAN-OUT WLP FOR HIGH POWER DEVICE PACKAGING 202
Yonggang Jin, Jerome Teysseyre, Anandan Ramasy Yun Liu, George Goh, Yiyi Ma

MEMS IN QFN 208
Tan Boo Wei, Wu Bin, Eric Erfe

EXTENDED COHESIVE ZONE MODEL FOR SIMULATION OF SOLDER/IMC INTERFACE CYCLIC DAMAGE PROCESS IN PB-FREE SOLDER INTERCONNECTS 211
A. F. M. Yamin, N. M. Shaffiar, W. K. Loh, M. N. Tamin

COMBINED MOLDING PACKAGE (PROXIMITY SENSOR) 216
Y. F. Lee, C. C. Kum

EXTENDING THE STORAGE LIFE OF STENCIL PRINTED WAFERS FOR SMALL DIE SIZE ON WAFER MOUNTING TAPE 222
Ee Lin Chung, Eric Erfe

MATERIAL CHARACTERISATION OF HIGH THERMALLY CONDUCTIVE DIE ATTACH PASTES FOR HIGH POWER APPLICATIONS 227
Ee Lin Chung, Eric Erfe

ON THE DROP IMPACT PERFORMANCE OF IPD™ DEVICES WITH DIFFERENT PROCESS TECHNOLOGIES 234
Yiyi Ma, Kim-Yong Goh, Xueren Zhang, Wei-Zhen Goh

HIGH PERFORMANCE AND RELIABLE TO PACKAGE 240
Lee Teck Sim, Yong Wae Chet

EFFECTS OF STACKING SEQUENCE OF ELECTRODEPOSITED SN AND BI LAYERS ON REFLOWED SN-BI SOLDER ALLOYS 246
Seen Fang Lee, Yingxin Goh, A. S. M. A. Haseeb

CORRELATION STUDY ON MOISTURE SOAK EQUIVALENT BETWEEN MSL1 (85/85% SOAKING 168 HOURS) AND AUTOCLAVE TEST IN TERM OF WEIGHT GAIN AND DELAMINATION 252
Jason Ng Boon Lim

ELIMINATION OF INTEGRATED CIRCUIT BOND PAD CRATER TEST OVER REJECTION 256
Rona Balabbo, Marvin Picardal

SINTERED SILVER (AG) AS LEAD-FREE DIE ATTACH MATERIALS 261
Kim S. Siow

ELIMINATION OF EPOXY BRIDGING IN DIEBOND PROCESS 267
Novin Yap, Caloy Hermosura, Freddie Pascual

DICING DIE ATTACH CHALLENGES AT MULTI DIE STACK PACKAGES 271
Tee Swee Xian, Perumal P. Nanthakumar

LOW-TEMPERATURE SINTERING OF NANOSILVER PASTE FOR LEAD-FREE CHIP ATTACH 276
Guo-Quan Lu

LOW COO PVD SOLUTIONS ADDRESSING 2.5D AND 3D TSV PACKAGING CHALLENGES. 278
Hans Auer, Hans Hirscher, Patrick Desjardins, Juergen Weichart

ALLOYED COPPER BONDING WIRE WITH HOMOGENEOUS MICROSTRUCTURE 284
S. Murali, Johnny Yeung, Roman Perez

CAVITY PACKAGES FOR VOLUME MEMS APPLICATIONS 290
Alan Evans

INNOVATIVE TIN ELECTROLYTE COMBINING HIGH TECHNICAL STANDARDS WITH SIGNIFICANT COST SAVING POTENTIALS 302
Olaf Kurtz, Peter Kuhlkamp, Jürgen Barthelmes, Robert Ruther, Din-Ghee Neoh, Sia-Wing Kok

LARGE AREA MOLD EMBEDDING TECHNOLOGY WITH PCB BASED REDISTRIBUTION 317
T. Braun, K.-F. Becker, L. Bottcher, A. Ostmann, E. Jung, S. Voges, T. Thomas, R. Kahle, V. Bader, J. Bauer, R. Aschenbrenner, M. Schneider Ramelow

PATTERNING OF MULTI-LEVELED MICROSTRUCTURES ON FLEXIBLE POLYMER SUBSTRATE USING ROLL-TO-ROLL ULTRAVIOLET NANOIMPRINT LITHOGRAPHY 324
Nazrin Kooy, Norian Rahman, Khairudin Mohamed

THE IMPACT OF STENCIL APERTURE DESIGN FOR NEXT GENERATION ULTRA-FINE PITCH PRINTING 329
Mark Whitmore, Jeff Schake, Clive Ashmore

HIGH RELIABILITY HIGH MELTING MIXED LEAD-FREE BIAGX SOLDER PASTE SYSTEM 336
Hongwen Zhang, Ning-Cheng Lee

BOND STITCH ON BALL FOR BARE COPPER WIRE 343
Tan Kai Chat, Liong Jin Yoong

AFFECT OF BINDER ON MECHANICAL AND PHYSICAL CHARACTERIZATION OF TITANIUM DIOXIDE BASED VARISTOR 350
Siamak Gholizadehsangesaraki, Shahida Begum, M. Ansari M. Nainar, Z. Kothandapani

PHYSICAL CHARACTERIZATION OF TITANIUM DIOXIDE BASED VARISTOR MATERIALS DOPED WITH COBALT OXIDE 355
Zarrin Kothandapani, Shahida Begum, M. Ansari M. Nainar, S. Gholizadeh, Wong Menn Yee

THREE DIMENSIONAL NUMERICAL PREDICTION OF EPOXY FLOW DURING THE UNDERFILL PROCESS IN FLIP CHIP PACKAGING 359
M. F. M. A. Majid, C. Y. Khor, M. K. Abdullah, M. Z. Abdullah, W. Y. Rahiman, A. Jappar, M. S. Aris

TAILORED NANOSTRUCTURED TITANIA GROWN ON TITANIUM MICROPILLARS WITH OUTSTANDING WICKING PROPERTIES FOR THERMAL MANAGEMENT OF MICROELECTRONICS DEVICES 365
A. S. Zuruzi, H. C. Gardner, N. C. Macdonald

DIE ATTACH CAPABILITY ON ULTRA THIN WAFER THICKNESS FOR POWER SEMICONDUCTOR 369
Zakaria Abdullah, Letcheemana Vigneswaran , Amy Ang , Goh Zhi Yuan

SIGNAL SENSITIVITY TO SUPPLY NOISE ON HIGH-SPEED I/O 374
Siang Rui Chan, Fern Nee Tan, Rosmiwati Mohd-Mokhtar

MATERIAL & PROCESS CHALLENGES FOR TIRE PRESSURE MONITORING SENSOR (TPMS) PACKAGING 380
Yanshan Ng, Edmund Sales Cabatbat, Lynn Simporios Guirit

CHALLENGES IN SOLDER ON LEADFRAME PACKAGES 386
Chee Yin Khuen, Thong Kai Choh

IMPROVEMENT JOURNEY OF STRIP TEST STICKY ISSUE 390
Euclea Cheah, Wuan Ning

SELECTIVE RESCREEN 396
Leslie Kok

CREEP PROPERTIES OF SOFT SOLDER DIE ATTACH WITH NI BALLS IN POWER PACKAGE APPLICATIONS 403
F. X. Che, Dandong Ge, Yik Siong Tay, Mohamad Yazid, Swee Lee Gan

MICROSTRUCTURAL STABILITY AND MECHANICAL PROPERTIES OF SN-1AG-0.5CU SOLDER ALLOY WITH 0.1 WT.% AL ADDITION UNDER HIGH-TEMPERATURE ANNEALING 409
Mohd Faizul Mohd Sabri, Dhafer Abdul-Ameer Shnawah, Irfan Anjum Badruddin, Suhana Binti Mohd Said

NUMERICAL & EXPERIMENTAL ANALYSIS OF BOND PAD STACK STRUCTURE FOR WIRE BOND INTERCONNECTION 414
F. X. Che, Alfred Yeo

INEMI PB-FREE ALLOY CHARACTERIZATION PROJECT REPORT: THERMAL FATIGUE RESULTS FOR LOW AND NO-AG ALLOYS 419
Gregory Henshall, Keith Sweatman, Keith Howell, Ursula Marquez De Tino, Jian Miremadi, Richard Parker, Richard Coyle, Joe Smetana, Jennifer Nguyen, Weiping Liu, Ranjit S. Pandher, Derek Daily, Mark Currie, Tae-Kyu Lee, Julie Silk, Bill Jones, Stephen Tisdale, Fay Hua

HIGHLIGHTS OF INEMI 2013 TECHNOLOGY ROADMAPS 430
Bob Pfahl, Haley Fu, Chuck Richardson

CURRENT AND FUTURE MANUFACTURING TEST SOLUTION STRATEGIES - INEMI BOUNDARY-SCAN AND BUILT IN SELF TEST (BIST) TECHNOLOGY INTEGRATION FOR FUTURE STANDARDIZATION 435
Zoë Conroy, Jun Balangue, Philip B. Geiger, Steve Butkovich

INVESTIGATION OF FACTORS THAT INFLUENCE CREEP CORROSION – INEMI PROJECT REPORT 442
Haley Fu

EFFECT OF NICKEL ADDITION INTO SN-3AG-0.5CU ON INTERMETALLIC COMPOUND FORMATION DURING SOLDERING ON COPPER 448
A. Ourdjini, I. Siti Rabiatull Aisha, Y. T. Chin

DESIGN AND CONSTRUCTION OF A DROPLET BASED MANUFACTURING MACHINE 451
Hamed Kalami, Hooman Kalami, Mehrdad Vahdati

THROUGH-SILICON VIA TECHNOLOGY FOR THREE-DIMENSIONAL INTEGRATED CIRCUIT MANUFACTURING 455
Yann Civale, Augusto Redolfi, Patrick Jaenen, Maarten Kostermans, Els Van Besien, Sofie Mertens, Thomas Witters, Nicolas Jourdan, Silvia Armini, Zaid El-Mekki, Kevin Vandersmissen, Harold Philipsen, Patrick Verdonck, Nancy Heylen, Philip Nolmans, Yunlong Li, Kristof Croes, Gerald Beyer, Bart Swinnen, Eric Beyne

THE CHALLENGES OF THIN CU WIRE BOND ON THIN FSM AND SMALL BPO 460
Tan Aik Teong, Shikh Zakaria Siti Amira Faisha, Lem Tien Heng

DEVELOPMENT OF INSULATED CU WIRE BALL BONDING 464
Faizal Zulkifli Mohd, Mohd Rusli Ibrahim, Wong Boh Kid, Navas Khan, Yap Boon Kar, L. C. Tan

EFFECT OF DIE ATTACH ADHESIVE DEFECTS ON THE JUNCTION TEMPERATURE UNIFORMITY OF LED CHIPS 469
Mian Tao, S. W. Ricky Lee, Matthew M. F. Yuen, Guoqi Zhang, Willem Van Driel

SOLDER PARAMATER SENSITIVITY FOR PACKAGE-ON-PACKAGE (POP) ON FATIGUE LIFE PREDICTION 476
Lim Han Bin, Ong Kang Eu, Ishak Abdul Azid

THERMAL ANALYSIS OF EMBEDDED CHIP 482
Lee Pik San, Ong Kang Eu, Ishak Abdul Azid

BONDING OF AG-ALLOY WIRE IN LED PACKAGES 488
Jie Wu, Tom Rockey, Oranna Yauw, Liming Shen, Bob Chylak

CHARACTERIZATION OF A WIRE BONDING PROCESS WITH THE ADDED CHALLENGES FROM PALLADIUM-COATED COPPER WIRES 492
A. C. K. Chang, A. B. Y. Lim, C. X. Lee, B. Milton, H. Clauberg, O. Yauw, B. Chylak

MICRO BALL BUMPING PACKAGING FOR WAFER LEVEL & 3-D SOLDER SPHERE TRANSFER AND SOLDER JETTING 497
Thomas Oppert, Thorsten Teutsch, Ghassem Azdasht, Elke Zakel

REMOVAL OF FLUX RESIDUES FROM HIGHLY DENSE ASSEMBLIES 503
Mike Bixenman, Jason Chan, T. C. Loy

EFFECT OF SURFACE MODIFICATION BY CITRIC ACID ON FLUXLESS VACUUM BONDING OF CU WITH SN-CU ALLOY 512
Masumi Hayakawa, Shinji Koyama, Ikuo Shohji

EFFECT OF FILLER CONTENT ON TENSILE PROPERTIES OF UNDERFILL MATERIAL FOR FLIP CHIP BONDING 516
Shinya Kitagoh, Hironao Mitsugi, Shinji Koyama, Ikuo Shohji

EFFECT OF STRAIN RATE ON TENSILE PROPERTIES OF MINIATURE SIZE LEAD-FREE ALLOYS 520
Yuichiro Toyama, Ikuo Shohji

PD COATED CU WIRE BOND ON XOAA MATERIAL IN LQFP PACKAGE 525
Wang Mei Yong, Jude Teo, Gan Swee Lee, Tan Kian Heong, Audrey Swee

ADVANCED/3D PACKAGING AND MATERIALS INTEGRITY: STRESS-INDUCED EFFECTS AND MECHANICAL PROPERTIES OF NEW ULTRA LOW-K DIELECTRICS FOR ON-CHIP INTERCONNECT STACKS 530
E. Zschech, B. Y. Kong, C. Sander

Author Index