

2015 IEEE International Interconnect Technology Conference and 2015 IEEE Materials for Advanced Metallization Conference (IITC/MAM 2015)

**Grenoble, France
18 – 21 May 2015**



**IEEE Catalog Number: CFP15ITR-POD
ISBN: 978-1-4673-7357-9**

TABLE OF CONTENTS

2

HIGH PERFORMANCE CU/LOW-K INTERCONNECT STRATEGY BEYOND 10NM LOGIC TECHNOLOGY	1
Kim, R.-H. ; Kim, B.H. ; Kim, J.N. ; Lee, J.J. ; Baek, J.M. ; Hwang, J.H. ; Hwang, J. ; Chang, J. ; Yoo, S.Y. ; Yim, T.J. ; Chung, K.-M. ; Park, K.H. ; Oszinda, T. ; Kim, I.S. ; Lee, E.B. ; Nam, S.D. ; Jung, S. ; Cho, Y.W. ; Choi, H.J. ; Kim, J.S. ; Ahn, S.H. ; Park, S.H. ; Yoon, B.U. ; Ku, J.-H. ; Paak, S.S. ; Lee, N.-I. ; Choi, S. ; Kang, H.-K. ; Jung, E.S.	
LOW-K INTERCONNECT STACK WITH MULTI-LAYER AIR GAP AND TRI-METAL-INSULATOR-METAL CAPACITORS FOR 14NM HIGH VOLUME MANUFACTURING	5
Fischer, K. ; Agostinelli, M. ; Allen, C. ; Bahr, D. ; Bost, M. ; Charvat, P. ; Chikarmane, V. ; Fu, Q. ; Ganpule, C. ; Haran, M. ; Heckscher, M. ; Hiramatsu, H. ; Hwang, E. ; Jain, P. ; Jin, I. ; Kasim, R. ; Kosaraju, S. ; Lee, K.S. ; Liu, H. ; McFadden, R. ; Nigam, S. ; Patel, R. ; Peltt, C. ; Plekhanov, P. ; Prince, M. ; Puls, C. ; Rajamani, S. ; Rao, D. ; Reese, P. ; Rosenbaum, A. ; Sivakumar, S. ; Song, B. ; Uncuer, M. ; Williams, S. ; Yang, M. ; Yashar, P. ; Natarajan, S.	
PROGRESS IN THIN WIRE BACK-END OF-LINE DEVELOPMENT	9
Seidel, R. ; Bonsdorf, G. ; Clauss, E. ; Daleiden, J. ; Donegan, K. ; Feustel, F. ; Hauschildt, M. ; Hintze, B. ; Koschinsky, F. ; Marxsen, G. ; Naumann, R. ; Peters, C. ; Queitsch, U. ; Talut, G. ; Theiss, D. ; Zinke, M.	
ROBUST TIN HM PROCESS TO OVERCOME UNDER ETCH ISSUE FOR SAV SCHEME ON 14NM NODE	13
Fu, Tzu-Hao ; Ke, Yuan-Fu ; Tsai, Shih-Chun ; Lin, Chun-Ling ; Chen, Kuo-Wei ; Huang, Ming-Yung ; Cho, Gary ; Lin, San-Fu ; Wang, Ting-Jun ; Cheng, Albert	

3

PLASMA ETCH CHALLENGES AT 14NM AND BEYOND TECHNOLOGY NODES IN THE BEOL	21
Brun, Ph. ; Bailly, F. ; Guillermet, M. ; Aparico, E. ; Possene, N.	
COBALT BOTTOM-UP CONTACT AND VIA PREFILL ENABLING ADVANCED LOGIC AND DRAM TECHNOLOGIES	25
van der Veen, Marleen H. ; Vandersmissen, K. ; Dictus, D. ; Demuynck, S. ; Liu, R. ; Bin, X. ; Nalla, P. ; Lesniewska, A. ; Hall, L. ; Croes, K. ; Zhao, L. ; Bommels, J. ; Kolics, A. ; Tokei, Zs.	
THEORETICAL INVESTIGATION OF IN SITU K-RESTORE PROCESSES FOR DAMAGED ULTRA-LOW-K MATERIALS	29
Forster, Anja ; Wagner, Christian ; Schuster, Jorg ; Gemming, Sibylle	
LOW TEMPERATURE THERMAL AND PLASMA ENHANCED ATOMIC LAYER DEPOSITION OF RUTHENIUM USING RUO₄ AND H₂/H₂-PLASMA	33
Minjauw, Matthias M. ; Dendooven, Jolien ; Capon, Boris ; Detavernier, Christophe ; Schaekers, Marc	

4

MODULATION OF THE SCHOTTKY BARRIER HEIGHT FOR ADVANCED CONTACT SCHEMES	39
Menghini, Mariela A. ; Homm, Pia ; Su, Chen-Yi ; Kittl, Jorge A. ; Tomita, Ryuji ; Hegde, Ganesh ; Lee, Joon-Gon ; Hyun, Sangjin ; Bowen, Chris ; Rodder, Mark.S. ; Afanas'ev, Valeri ; Locquet, Jean-Pierre	
NANOMETRE SCALE 3D NANOMECHANICAL IMAGING OF SEMICONDUCTOR STRUCTURES FROM FEW NM TO SUB-MICROMETRE DEPTHS	43
Kolosov, O.V. ; Dinelli, F. ; Robson, A. ; Krier, A. ; Hayne, M. ; Fal'ko, V.I. ; Henini, M.	
NUMERICAL ANALYSIS OF AIRGAP STABILITY UNDER PROCESS-INDUCED THERMO-MECHANICAL LOADS	47
Zahedmanesh, Houman ; Gonzalez, Mario ; Ciofi, Ivan ; Croes, Kristof ; Boemels, Juergen ; Tokei, Zsolt	

FULL 3D RECIPROCAL SPACE MAP OF THIN POLYCRYSTALLINE FILMS FOR MICROELECTRONIC APPLICATIONS	53
<i>Thanh, T.Nguyen ; Blanc, N. ; Boudet, N. ; Bourjot, E. ; Zhiou, S. ; Kovacova, V. ; Rodriguez, P. ; Nemouchi, F. ; Gergaud, P.</i>	
IN-SITU ELECTRICAL CHARACTERIZATION OF PT/NIO/PT RESISTIVE MEMORY ELEMENTARY CELLS DURING FIB MILLING: A STEP TOWARDS ELECTRICAL TOMOGRAPHY OF NANOFILAMENTS.....	57
<i>Guedj, C. ; Auvert, G. ; Martinez, E.</i>	
EFFECT OF THE TEMPERATURE ON THE STRAIN DISTRIBUTION INDUCED IN SILICON INTERPOSER BY TSVS: A COMPARISON BETWEEN MICRO-LAUE AND MONOCHROMATIC NANODIFFRACTION	59
<i>Vianne, B. ; Krauss, C. ; Escoubas, S. ; Richard, M.-I. ; Labaf, S. ; Chahine, G. ; Schulli, T. ; Micha, J.-S. ; Fiori, V. ; Farcy, A. ; Thomas, O.</i>	
INFLUENCE OF THE SUBSTRATE ON THE SOLID-STATE REACTION OF ULTRA-THIN NI FILM WITH A $\text{IN}_{0.53}\text{GA}_{0.47}\text{AS}$ UNDER-LAYER BY MEANS OF FULL 3D RECIPROCAL SPACE MAPPING	63
<i>Zhiou, S. ; Rodriguez, Ph. ; Gergaud, P. ; Nemouchi, F. ; Thanh, T.Nguyen</i>	
ATOMIC OXYGEN TREATMENT OF CARBON CONTAINING LOW-K DIELECTRIC MATERIALS TO FACILITATE MANGANESE SILICATE BARRIER FORMATION	67
<i>Bogan, J. ; McCoy, A.P. ; Byrne, C. ; O'Connor, R. ; Hughes, G.</i>	
STABILITY OF GETE-BASED PHASE CHANGE MATERIAL STACK UNDER THERMAL STRESS: REACTION WITH Ti STUDIED BY COMBINED IN-SITU X-RAY DIFFRACTION, SHEET RESISTANCE AND ATOM PROBE TOMOGRAPHY	71
<i>Mangelinck, Dominique ; Putero, Magali ; Descoins, Marion ; Perrin-Pellegrino, Carine</i>	
NUMERICAL SIMULATION OF NANO-INDENTATION INDUCED FRACTURE OF LOW-K DIELECTRIC THIN FILMS USING THE CUBE CORNER INDETER.....	75
<i>Zahedmanesh, Houman ; Vanstreels, Kris ; Gonzalez, Mario</i>	
MODELING AND ANALYSIS OF VERTICAL NOISE COUPLING BETWEEN CLOCK TREE AND CHANNEL ROUTING WIRE IN 3D MIXED SIGNAL INTEGRATION	79
<i>Wang, Shiwei ; Ding, Yingtao ; He, Huanyu ; Lu, Jian-Qiang</i>	
THIN AMORPHOUS SILICON OXIDE ICPECVD LAYER ON GOLD SURFACE FOR SURFACE PLASMON RESONANCE MEASUREMENTS.....	83
<i>Herth, Etienne ; Zeggari, Rabah ; Rauch, Jean-Yves ; Remy-Martin, Fabien ; Boireau, Wilfrid</i>	
SIMPLE TEST VEHICLE FOR METAL FILL AND RESISTANCE OF SUB-8NM NANOWIRE	87
<i>Sung, Seung Hoon ; Chawla, Jasmeet ; Carver, Colin ; Chebiam, Ramanan ; Clarke, James ; Jezewski, Chris ; Tronic, Tristan ; Turkot, Bob ; Yoo, Hui Jae</i>	
OPTIMIZED PORE STUFFING FOR ENHANCED COMPATIBILITY WITH INTERCONNECT INTEGRATION FLOW	91
<i>de Marneffe, J.-F. ; Zhang, L. ; Rutigliani, V. ; Noya, G. ; Cao, Y. ; Lesniewska, A. ; Pedreira, O. ; Croes, K. ; Gillot, C. ; Tokei, Z. ; Boemmel, J. ; Baklanov, M.R.</i>	
INVESTIGATION OF BARRIER FORMATION AND STABILITY OF SELF-FORMING BARRIERS WITH CUMN, CUTI AND CUZR ALLOYS	95
<i>Franz, Mathias ; Ecke, Ramona ; Kaufmann, Christian ; Kriz, Jakob ; Schulz, Stefan E.</i>	
IMPACT OF UV WAVELENGTH AND CURING TIME ON THE PROPERTIES OF SPIN-COATED LOW-K FILMS	99
<i>Redzhev, M. ; Prager, L. ; Krishtab, M. ; Armini, S. ; Vanstreels, K. ; Franquet, Alexis ; Van Der Voort, P. ; Baklanov, M.R.</i>	
POST-ETCH TEMPLATE REMOVAL STRATEGY FOR REDUCTION OF PLASMA INDUCED DAMAGE IN SPIN-ON OSG LOW-K DIELECTRICS.....	103
<i>Krishtab, M. ; Vanstreels, K. ; De Gendt, S. ; Baklanov, M.</i>	
IN SITU CLEANING/PASSIVATION OF SURFACES FOR CONTACT TECHNOLOGY ON III-V MATERIALS	107
<i>Rodriguez, Philippe ; Toselli, Laura ; Ghegin, Elodie ; Nemouchi, Fabrice ; Rochat, Nevine ; Martinez, Eugenie</i>	
CHARACTERISATION OF CUAL ALLOY FOR FUTURE INTERCONNECT TECHNOLOGIES	111
<i>Byrne, C. ; McCoy, A.P. ; Bogan, J. ; Brady, A. ; Hughes, G.</i>	
PROCESS DEVELOPMENT OF REPLACEMENT METAL GATE TUNGSTEN CHEMICAL MECHANICAL POLISHING ON 14NM TECHNOLOGY NODE AND BEYOND.....	115
<i>Lin, J.C. ; Liu, H.J. ; Lin, W.C. ; Lin, C.H. ; Hung, T.H. ; Li, K.R. ; Lin, J.F. ; Wang, J.Y. ; Liu, C.C. ; Wu, J.Y</i>	

COBALT COMPATIBLE CLEANING SOLUTIONS FOR 14NM AND BEYOND.....	119
<i>Courouble, Kristell ; Brousseau, Lucile ; Zoll, Stephane ; Haxaire, Katia ; Mellier, Maxime ; Druais, Gael Vincent ; Ayral, Andre</i>	
CONTRIBUTION OF MOLECULAR SIMULATION TO THE CHARACTERIZATION OF POROUS LOW-K MATERIALS	123
<i>Broussous, d Lucile ; Lepinay, Matthieu ; Coasne, Benoit ; Licitra, Christophe ; Bertin, Francois ; Rouessac, Vincent ; Ayral, Andre</i>	
DIRECT COPPER ELECTRODEPOSITION ON NOVEL COMO DIFFUSION BARRIER.....	127
<i>Wang, Xu ; Cao, Li-Ao ; Qu, Xin-Ping</i>	
SUB-90NM PITCH Cu LOW-K INTERCONNECT ETCH SOLUTION USING RF PULSING TECHNOLOGY	131
<i>Liao, J H ; Lai, Yu Tsung ; Wan, Stan ; Kuo, Brandon ; Gopaladasu, Prabhakara ; Wei, David ; Yao, Sean ; Lin, Wesley ; Wang, Ivan ; Lin, Paul ; Finch, Barrett ; Deshmukh, Shashank</i>	
VARIABILITY OF QUADRUPLE-PATTERNING INTERCONNECT PROCESSES.....	135
<i>Baert, Rogier ; Ciofi, Ivan ; Wilson, Christopher J. ; Gonzalez, Victor Vega ; Bommels, Jurgen ; Tokei, Zsolt ; Ryckaert, Julien ; Raghavan, Praveen ; Mercha, Abdelkarim ; Verkest, Diederik</i>	
DEMONSTRATION OF NEW PLANAR CAPACITOR (PCAP) VEHICLES TO EVALUATE DIELECTRICS AND METAL BARRIER THIN FILMS	139
<i>Lin, Kevin L. ; Bielefeld, Jeffrey ; Chawla, Jasmeet S. ; Carver, Colin T. ; Chebiam, Ramanan ; Clarke, James S. ; Faber, Jacob ; Harmes, Michael ; Indukuri, Tejaswi ; Jezewski, Christopher ; Kasim, Rahim ; Kobrinsky, Mauro ; Kabir, Nafees A. ; Krist, Brian ; Lakamraju, Narendra ; Lang, Hazel ; Mays, Ebony ; Myers, Alan M. ; Plombon, John J. ; Singh, Kanwal Jit ; Torres, Jessica ; Yoo, Hui Jae</i>	
ALTERNATIVE ULK INTEGRATION APPROACH USING A SACRIFICIAL LAYER IN A STANDARD DUAL DAMASCENE FLOW	143
<i>Uhlig, Benjamin ; Calvo, Jesus ; Koch, Johannes ; Thrun, Xaver ; Liske, Romy</i>	
A STUDY OF BEOL RESISTANCE MISMATCH IN DOUBLE PATTERNING PROCESS.....	147
<i>Yao, Shaoning ; Clevenger, Larry ; Zamdmmer, Noah</i>	
EVALUATION OF ADHESION ENERGY AND ITS CORRELATION TO APPARENT STRENGTH FOR Cu/SiN INTERFACE IN COPPER DAMASCENE INTERCONNECT STRUCTURES	151
<i>Kamiya, S. ; Chen, C. ; Shishido, N. ; Omiya, M. ; Koiwa, K. ; Sato, H. ; Nishida, M. ; Suzuki, T. ; Nakamura, T. ; Nokuo, T. ; Suzuki, T.</i>	
ELECTROMIGRATION-LIMITED RELIABILITY OF ADVANCED METALLIZATION FOR MEMORY DEVICES	155
<i>Jang, Kyung-Tae ; Park, Yong-Jin ; Jeong, Min-Woo ; Lim, Seung-Min ; Ycon, Han-Wool ; Cho, Ju-Young ; Shin, Jin-Sub ; Woo, Byoung-Wook ; Bae, Jang-Yong ; Hwang, Yu-Chul ; Joo, Young-Chang</i>	
COMPACT MODEL FOR SOLDER BUMP ELECTROMIGRATION FAILURE	159
<i>Ceric, H. ; Selberherr, S.</i>	

6

MORPHIC ATOMIC SWITCH NETWORKS FOR BEYOND-MOORE COMPUTING ARCHITECTURES	165
<i>Aguilera, Renato ; Demis, Eleanor ; Scharnhorst, Kelsey ; Stieg, Adam Z. ; Aono, Masakazu ; Gimzewski, James K.</i>	
NICKEL SUICIDE FOR INTERCONNECTS	169
<i>Lin, Kevin L. ; Bojarski, Stephanie A. ; Carver, Colin T. ; Chandhok, Manish ; Chawla, Jasmeet S. ; Clarke, James S. ; Harmes, Michael ; Krist, Brian ; Lang, Hazel ; Mayeh, Mona ; Naskar, Sudipto ; Plombon, John J. ; Sung, Seung Hoon ; Yoo, Hui Jae</i>	
DIRECT ETCHED Cu CHARACTERIZATION FOR ADVANCED INTERCONNECTS	173
<i>Wen, Lianggong ; Yamashita, Fumiko ; Tang, Baojun ; Croes, Kristof ; Tahara, Shigeru ; Shimoda, Keiichi ; Maeshiro, Takeru ; Nishimura, Eiichi ; Lazzarino, Frederic ; Ciofi, Ivan ; Bommels, Jurgen ; Tokei, Zsolt</i>	
FABRICATION AND CHARACTERIZATION OF PIEZOELECTRIC MICROGENERATORS FOR FLEXIBLE ENERGY HARVESTING USING P(VDF-TRFE) SCREEN-FORMULATED INKS	177
<i>Gusarov, E. ; Viala, B. ; Plihon, A. ; Gusarov, B. ; Gimeno, L. ; Cugat, O.</i>	

7

INFLUENCE OF ALLOYING ELEMENTS ON THE PHASE FORMATION OF ULTRATHIN NI (<10NM) ON Si(001) SUBSTRATES.....	183
<i>Geenen, F.A. ; Van Stiphout, K. ; Jordan-Sweef, J. ; Vantomme, A. ; Lavoie, C. ; Detavernier, C.</i>	

IMPROVED NISI CONTACTS ON SI BY CF4 PLASMA IMMERSION ION IMPLANTATION FOR 14NM NODE MOSFETS	187
Zhang, Haitao ; Duchaine, Julian ; Torregrosa, Frank ; Liu, Linjie ; Hollander, Bernd ; Breuer, Uwe ; Mantl, Siegfried ; Zhao, Qing-Tai	
NICKEL SUICIDE FOR SOURCE-DRAIN CONTACTS FROM ALD NIO FILMS.....	191
Pore, Viljami ; Tois, Eva ; Matero, Raija ; Haukka, Suvi ; Tuominen, Marko ; Woodruff, Jacob ; Milligan, Brennan ; Tang, Fu ; Givens, Michael	
8	
DEMONSTRATION OF A COST EFFECTIVE CU ELECTROLESS TSV METALLIZATION SCHEME.....	197
Vandersmissen, Kevin ; Inoue, F. ; Velenis, D. ; Li, Y. ; Dictus, D. ; Frees, B. ; Van Huylenbroeck, S. ; Kondo, M. ; Seino, T. ; Heylen, N. ; Struyf, H. ; van der Veen, M.H.	
WAFER LEVEL METALLIC BONDING: VOIDING MECHANISMS IN COPPER LAYERS	201
Imbert, B. ; Gondcharton, P. ; Benissa, L. ; Fournel, F. ; Verdier, M.	
ADVANCED INTEGRATED METALLIZATION ENABLES 3D-IC TSV SCALING	205
Yu, Jengyi ; Gopinath, Sanjay ; Nalla, Praveen ; Thorum, Matthew ; Schloss, Larry ; Anjos, Daniela M. ; Meshram, Prashant ; Harm, Greg ; Richardson, Joe ; Mountsier, Tom	
9	
INTERCONNECT FOR EMERGING NEW MEMORIES	211
Ping, Er-Xuan	
RESISTIVE SWITCHING IN OXIDES FOR NONVOLATILE MEMORIES AND NEUROMORPHIC COMPUTING	213
Spiga, Sabina	
INFLUENCE OF ALLOYING THE COPPER SUPPLY LAYER ON THE RETENTION OF CBRAM	215
Devulder, Wouter ; Opsomer, Karl ; Jurczak, Malgorzata ; Goux, Ludovic ; Detavernier, Christophe	
10	
COBALT UBM FOR FINE PITCH MICROBUMP APPLICATIONS IN 3DIC	221
Derakhshandeh, Jaber ; De Preter, Inge ; Vandersmissen, Kevin ; Dictus, Dries ; Di Piazza, Luca ; Hou, Lin ; Guerrieri, Stefano ; Vakanas, George ; Armini, Silvia ; Daily, Robert ; Lesniewska, Alicja ; Vandelaer, Yannick ; Van De Peer, Myriam ; Slabbeekorn, John ; Rebibis, Kenneth June ; Miller, Andy ; Beyer, Gerald ; Beyne, Eric	
LOW-COST, SINGLE-STEP HYBRID BOND/BARRIER FILMS FOR CU BONDLINES IN ADVANCED PACKAGING	225
Xiao, Qiran ; Watson, Brian ; Dauskardt, Reinhild H.	
COPPER-COPPER DIRECT BONDING: IMPACT OF GRAIN SIZE	229
Gondcharton, P. ; Imbert, B. ; Benissa, L. ; Verdier, M.	
ALUMINUM-CAPPED COPPER BOND PADS FOR ULTRASONIC HEAVY COPPER WIRE-BONDING ON POWER DEVICES.....	233
Gross, David ; Haag, Sabine ; Reinold, Manfred ; Schneider-Ramelow, Martin ; Lang, Klaus-Dieter	
FABRICATION, ASSEMBLY, FAILURE ESTIMATIONS OF FOR ULTRA-THIN CHIPS STACKING BY USING PRE-MOLDING TECHNOLOGY	237
Lee, Chang-Chun ; Lin, Yu-Min ; Liou, Yan-Yu ; Zhan, Chau-Jie ; Chang, Tao-Chih	
EXPERIMENTAL CHARACTERIZATION OF TSV LIQUID COOLING FOR 3D INTEGRATION.....	241
Park, Manseok ; Kim, Sungdong ; Kim, Sarah Eunkyung	
SI INTERPOSER WITH HIGH ASPECT RATIO COPPER FILLED TSV FOR SYSTEM INTEGRATION	245
Song, C. ; Xue, K. ; Yang, S. ; Yong, Z. ; Li, H. ; Jing, X. ; Lee, U. ; Zhang, W.	
ANALYSIS OF THERMAL EFFECTS OF THROUGH SILICON VIA IN 3D IC USING INFRARED MICROSCOPY.....	249
Shin, Yoonhwan ; Kim, Sarah Eunkyung ; Kim, Sungdong	
HIGH-VOLTAGE MONOLITHIC 3D CAPACITORS BASED ON THROUGH-SILICON-VIA TECHNOLOGY	253
Gruenler, Saeideh ; Rattmann, Gudrun ; Erlbacher, Tobias ; Bauer, Anton J. ; Frey, Lothar	

NI SILICIDES FORMATION: USE OF GE AND PT TO STUDY THE DIFFUSING SPECIES, LATERAL GROWTH AND RELAXATION MECHANISMS	257
<i>Kousseifi, Mike El ; Hoummada, Khalid ; Epicier, Thierry ; Mangelinck, Dominique</i>	
TC DEGRADATION AND ROOT-CAUSE ANALYSIS OF SACVD BPSG FILM FOR ROBUST IC FABRICATION.....	261
<i>Park, Jongwoo ; Lee, Miji ; Kang, Han Byul ; Lee, Dong Keun ; Kim, Jung Dong ; Pae, Sangwoo</i>	
SELECTIVE CO GROWTH ON CU FOR VOID-FREE VIA FILL	265
<i>Zheng, Jun-Fei ; Chen, Philip ; Baum, Tomas H. ; Lieten, Ruben R. ; Hunks, William ; Lippy, Steven ; Frye, Asa ; Li, Weimin ; O'Neill, James ; Xu, Jeff ; Zhu, John ; Bao, Jerry ; Machkaoutsan, Vladimir ; Badaroglu, Mustafa ; Yeap, Geoffrey ; Murdoch, Gayle ; Bommels, Jurgen ; Tokei, Zsolt</i>	
SOLID STATE REACTION OF NI THIN FILM ON N-INP SUSBTRATE FOR III-V LASER CONTACT TECHNOLOGY	269
<i>Ghegin, E. ; Nemouchi, F. ; Labar, J. ; Favier, S. ; Perrin, C. ; Hoummada, K. ; Gurban, S. ; Gergaud, P.</i>	
A 300MM SI PHOTONICS PLATFORM FOR OPTICAL INTERCONNECTION.....	273
<i>Mogami, Tohru ; Horikawa, Tsuyoshi ; Kinoshita, Keizo ; Sasaki, Hironori ; Morito, Ken ; Kurata, Kazuhiko</i>	
PROCESS CONTROL AND MONITORING IN DEVICE FABRICATION FOR OPTICAL INTERCONNECTION USING SILICON PHOTONICS TECHNOLOGY	277
<i>Horikawa, Tsuyoshi ; Shimura, Daisuke ; Jeong, Seok-Hwan ; Tokushima, Masatoshi ; Kinoshita, Keizo ; Mogami, Tohru</i>	
CARBON NANOTUBES TSV GROWN ON AN ELECTRICALLY CONDUCTIVE ZRN SUPPORT LAYER	281
<i>Vollebregt, Sten ; Banerjee, Sourish ; Tichelaar, Frans D. ; Ishihara, Ryoichi</i>	
NANOSTRUCTURED MATERIAL FORMATION FOR BEYOND SI DEVICES	285
<i>Chang, H.L. ; Chang, C.T. ; Kuo, C.T.</i>	
CARBON NANOMATERIALS BASED TSVS FOR DUAL SENSING AND VERTICAL INTERCONNECT APPLICATION	289
<i>Sofela, Samuel O ; Younes, Hammad ; Jelbuldina, Madina ; Saadat, Irfan ; Ghaferi, Amal Al</i>	

11

RELIABILITY MECHANISMS AND LIFETIME EXTRAPOLATION METHODS FOR SCALED INTERCONNECT TECHNOLOGIES	295
<i>Croes, K. ; Wu, C. ; Kocaay, D. ; Bommels, J. ; Tokei, Zs.</i>	
LOW VOLTAGE IMD-TDBB LIFETIME MODEL FOR ADVANCED FUTURE LOGIC TECHNOLOGY NODES.....	299
<i>Jeong, Tae-Young ; Kim, Jinseok ; Jo, Yunhee ; Tak, Kyuho ; Lee, Miji ; Windu, Sari ; Choi, Hyunjun ; Choi, Yuri ; Jo, Yunkyoung ; Pae, Sangwoo ; Park, Jongwoo</i>	
A FLEXIBLE TOP METAL STRUCTURE TO IMPROVE ULTRA LOW-K RELIABILITY	303
<i>Cheng, K. F. ; Teng, C. L. ; Huang, H. Y. ; Chen, H. C. ; Shih, C. W. ; Liu, T. H. ; Tsai, C. H. ; Lu, C. W. ; Wu, Y. H. ; Lee, H. H. ; Lee, M. H. ; Hsieh, M. H. ; Lin, B. L. ; Hou, S. Y. ; Lee, C. J. ; Lu, H. H. ; Bao, T. I. ; Shue, S. L. ; Yu, C. H.</i>	
RE-THINK STRESS MIGRATION PHENOMENON WITH STRESS MEASUREMENT IN 12 YEARS	307
<i>Matsuyama, Hideya ; Suzuki, Takashi ; Nakamura, Tomoji ; Shiozu, Motoki ; Ehara, Hideo</i>	

12

NANOCARBON INTERCONNECTS: DEMONSTRATION OF PROPERTIES BETTER THAN CU AND REMAINING ISSUES	313
<i>Sato, Shintaro</i>	
GRAPHENE WIRES AS ALTERNATIVE INTERCONNECTS	317
<i>Asselberghs, I. ; Politou, M. ; Soree, B. ; Sayan, S. ; Lin, D. ; Pashaei, P. ; Huyghebaert, C. ; Raghavan, P. ; Radu, I. ; Tokei, Z.</i>	
ELECTRICAL PROPERTIES OF 30 NM WIDTH BI-LAYER INTERCONNECTS OF MULTI LAYER GRAPHENE AND NI.....	321
<i>Ishikura, Taishi ; Isobayashi, Atsunobu ; Nishide, Daisuke ; Ito, Ban ; Saito, Tatsuro ; Matsumoto, Takashi ; Yamazaki, Yuichi ; Miyazaki, Hisao ; Watanabe, Masahito ; Sakuma, Naoshi ; Kajita, Akihiro ; Sakai, Tadashi</i>	

13

RELIABILITY STUDY OF LINER/BARRIER/SEED OPTIONS FOR VIA-MIDDLE TSV'S WITH 3 MICRON DIAMETER AND BELOW	327
<i>Li, Yunlong ; Van Huylenbroeck, Stefaan ; Roussel, Philippe ; Brouri, Mohand ; Gopinath, Sanjay ; Anjos, Daniela M. ; Thorum, Matthew ; Yu, Jengyi ; Beyer, Gerald P. ; Beyne, Eric ; Croes, Kristof</i>	
THERMAL IMPACT STUDY OF BLOCK FOLDING AND FACE-TO-FACE BONDING IN 3D IC	331
<i>Peng, Yarui ; Jung, Moongon ; Song, Taigon ; Wan, Yang ; Lim, Sung Kyu</i>	
3D IC POWER BENEFIT STUDY UNDER PRACTICAL DESIGN CONSIDERATIONS.....	335
<i>Song, Taigon ; Jung, Moongon ; Wan, Yang ; Peng, Yarui ; Lim, Sung Kyu</i>	

14

RESISTIVITY OF SUB-30 NM COPPER LINES	341
<i>Roberts, Jeanette M. ; Kaushik, Ananth P. ; Clarke, James S.</i>	
ALTERNATIVE INTEGRATION OF ULTRALOW-K DIELECTRICS BY TEMPLATE REPLACEMENT APPROACH.....	345
<i>Zhang, L. ; de Marneffe, J.-F. ; Heylen, N. ; Murdoch, G. ; Tokei, Z. ; Boemmels, J. ; De Gendt, S. ; Baklanov, M.R.</i>	
OPTIMIZING ULK FILM PROPERTIES TO ENABLE BEOL INTEGRATION WITH TDDB RELIABILITY.....	349
<i>Ryan, E.Todd ; Priyadarshini, D. ; Gates, S.M. ; Shobha, H. ; Chen, J. ; Virwani, K. ; Madan, A. ; Adams, E. ; Huang, E. ; Liniger, E. ; Collins, D. ; Stolfi, M. ; Yim, K.S. ; Demos, A. ; Grill, A.</i>	
EXPERIMENTAL INVESTIGATIONS ON A PLASMA ASSISTED IN SITU RESTORATION PROCESS FOR SIDEWALL DAMAGED ULTRA LOW-K DIELECTRICS	353
<i>Kohler, Nicole ; Fischer, Tobias ; Zimmermann, Sven ; Schulz, Stefan E.</i>	
Author Index	