Curriculum Vita

R. WAYNE JOHNSON

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EDUCATION

Ph.D. in Electrical Engineering from Auburn University, August 1987, Dissertation: "Hybrid Silicon Wafer Scale Packaging Technology". Minor sequence in Materials Engineering. 1985 IEEE Solid State Circuits Council Fellowship, (GPA 4.0/4.0).

Masters of Science in Electrical Engineering from Vanderbilt University, December 1982, Masters Thesis: "Polymer Thick Film Materials for Microwave Applications". Minor sequence in Materials Science, (GPA 4.0/4.0).

Bachelor of Engineering in Electrical Engineering (Summa Cum Laude) from Vanderbilt University, May 1979. Received Dean's Award and Tau Beta Pi Award. Projects included fabrication of microwave circuits, packaging of analog circuits and high temperature hybrids, (GPA 3.0/3.0).

WORK EXPERIENCE

Alumni Professor (tenured) - Auburn University, September 15, 1997 - Present. Research interests in electronics manufacturing, advanced packaging, and high temperature electronics.

Director, Center for Advanced Vehicle Electronics – A NSF Industry/University Cooperative Research Center – Auburn University, July 1, 1999 – Present. The focus of the Center is the electronics packaging and manufacturing technologies for harsh environments.

Director – Laboratory for Electronics Assembly & Packaging, September 16, 1987 – Present. Responsible for research, teaching and facilities in the Laboratory for Electronics Assembly & Packaging.

Professor (tenured) - Auburn University, September 15, 1995 - September 14, 1997. Research interests in multichip modules, electronic materials and processing, power electronics, and high temperature electronics.

Chairman - Consortium for Vehicle Electronics Management Committee, March 1995 - September 30, 1997. Consortium of five companies and Auburn University working to

develop low cost packaging technology for automotive and aerospace applications. Funded ($12,000,000) by the Consortium members and DARPA. Responsible for program management and reporting.

Acting Director - The Center for the Commercial Development of Space Power and Advanced Electronics, September 1, 1995 - May 1, 1996. Program Management responsible for research in power and advanced electronics including silicon carbide, electronics packaging, electronics manufacturing, and power electronics.

Associate Director - The Center for the Commercial Development of Space Power and Advanced Electronics, February 1, 1994 - August 31, 1995. Responsible for research programs in advanced electronics including silicon carbide, electronics packaging and electronics manufacturing.

Associate Professor (tenured) - Auburn University, September 15, 1991 - September 14, 1995. Research interests in multichip modules, electronic materials and processing, power electronics, and high temperature electronics.

Assistant Professor - Auburn University, September 15, 1987 - September 14, 1991. Research interests in multichip modules, electronic materials and processing, and power electronics. Established teaching and research program in thick and thin film microelectronics including laboratory facilities. Also taught undergraduate circuits and design courses.

Graduate Research Assistant - Auburn University, September 17, 1984 - September 14, 1987. Studied for Ph.D. in Electrical Engineering with research interests in multichip packaging, electronic materials and processing, and power hybrids. Research funded by the Semiconductor Research Corporation.

Graduate Teaching Assistant - Auburn University, September 17, 1984 - August 25, 1985. Taught undergraduate circuits and electronics courses.

Senior Product Engineer - Amperex Electronics Corp., February 15, 1984 - September 14, 1984. Primary responsibility: applications engineering and product management for custom hybrid and discrete semiconductor products.

Hybrid Electronics Engineer - Eaton Corporation, January 3, 1983 - February 15, 1984. Primary responsibility: establish in-house, thick film facility to produce 3-5 million industrial hybrid circuits per year. Tasks included process development, hybrid design, process documentation, production scheduling, cost estimating and supervision of operators.

Instructor - Vanderbilt University, January 1, 1982 - May 15, 1982. Taught hybrid microelectronics course and laboratory.

Product Specialist - DuPont, Electrical Materials Division, July 1, 1979 - December 31, 1980. Primary responsibilities: to assist DuPont customers with the processing of thick film materials with responsibility for all military accounts and several key high-volume commercial accounts. Laboratory facilities were used to produce and evaluate prototype and test parts to verify materials and processes and for military qualification tests. Other

responsibilities included failure analysis, evaluation of new materials and processes, customer training seminars and supervision of laboratory personnel.

Project Engineer - Microsystems Technology, Inc., May 1977 - April 1979 (part-time). Major projects: evaluation of materials and processes to produce circuits for use in high temperature (275°C) environments; and design, layout, fabrication, and testing of thick-film multilayer hybrid microcircuits for the F18 Multi-Purpose Display Group.

AWARDS

Best Paper of Conference Award for the paper entitled, "Assembly and Reliability of Flip Chip-on-Laminate with Lead Free Solder," by Zhenwei Hou, Casey Hatcher, R. Wayne Johnson, Erin Yaeger, Mark Konarski and Larry Crane, 2001 HD International Conference, Santa Clara, CA April 18-20, 2001.

Best Paper of Conference Award for the paper entitled, "Comparison of Die Level Stress with Convection and Variable Frequency Microwave Encapsulant Curing for Chip-on-Board," by Yida Zou, R. Wayne Johnson, Jeffery C. Suhling, Joe Harris, Cheryl Kromis, Iftikhar Ahmad, Denise Tucker, and Zak Fathi, International Conference on High Density Packaging and MCMs, April 6-9, 1999, Denver, CO.

Outstanding Paper of Conference Award for the paper entitled, "Flip Chip on Laminate Manufacturability," by Jing Qi, R. Wayne Johnson, Erin Yaeger, Mark Konarski, and Larry Crane, International Conference on High Density Packaging and MCMs, April 6-9, 1999, Denver, CO.

1997 Daniel C. Hughes Award from the International Society for Hybrid Microelectronics for "significant technical contributions and continued academia impact on the industry". This is the top award given by the Society and includes life membership.

1997 Senior Faculty Research Award presented by the Auburn Alumni Engineering Council.

1997 Alumni Professorship presented by the Auburn Alumni Association. This is a five-year appointment.

1994 Fellow of the Society Award from the International Society for Hybrid Microelectronics for "his significant and continuing contributions to ISHM over the course of many years".

1993 John A. Wagnon, Jr. Technical Achievement Award from the International Society for Hybrid Microelectronics for "his contributions in establishing teaching and research programs in multichip modules, electronic materials and processing, power electronics, and high temperature electronics. He was instrumental in the start of the ISHM National Technical Program Committee, Multichip Module Workshops and Conferences, as well as professional development courses".

PUBLICATIONS

Refereed Journal Articles (Published)

Jing Qi, R. Wayne Johnson, Erin Yaeger, Mark Konarski, Todd Doody, Z. Andrew Szczepaniak, and Larry Crane," Manufacturability Issues in Flip Chip on Laminate Assembly," *International Journal of Microcircuits and Electronic Packaging, Vol 22, No. 3, 3rd Qtr., 1999, pp. 270--279.*

Lawrence Crane, Afranio Torres-Filho, Chris Ober, and Wayne Johnson, "Development of Reworkable Underfills, Materials, Reliability and Processing," IEEE Transactions on Advanced Packaging, Vol. 22, No. 2, 1999.

Y. Zou, Jeffery Suhling, R. Wayne Johnson, R. C. Jaeger, and A. K. M. Mian, "In-Situ Stress State Measurements During Chip-on-Board Assembly," IEEE Transactions on Electronics Packaging Manufacturing, Vol. 22, No. 1, 1999, pp. 38-52.

R. Wayne Johnson, Michael Palmer, Michael Bozack and Tamara Issac-Smith, "Thermosonic Gold Wire Bonding to Laminate Substrates with Palladium Finishes," IEEE Transactions on Electronics Packaging Manufacturing, Vol. 22, No. 1, 1999, pp. 7-15.

R. Wayne Johnson, David Price, Dan Maslyk, Michael Palmer, Stuart Wentworth, Charles Ellis, John Czarnowski and Justin Bolger, "Patterned Adhesive Flip Chip Technology for Assembly on Polyimide Flex Substrates," *International Journal of Microcircuits and Electronic Packaging, Vol 20, No. 3, 3rd Qtr., 1997, pp. 309-316.*

Chris Dunn, R. Wayne Johnson, Mike Bozack, Cheryl Kromas, Joe Harris, and Marnie Knadler, "Thermosonic Gold Ball Bonding to Immersion Gold/Electroless Nickel Plating Finishes on Laminate MCM Substrates," *International Journal of Microcircuits and Electronic Packaging, Vol 20, No. 3, 3rd Qtr., 1997, pp. 317-324.*

Marcus Lankford, Kyle Davis, R. Wayne Johnson, M. E. Baginski, and Hayden Hontgas, "Electromagnetic Compatibility Design and Performance of Multichip Modules," *International Journal of Microcircuits and Electronic Packaging, Vol 20, No. 3, 3rd Qtr., 1997, pp. 333-338.*

Robert Newberry, R. Wayne Johnson, Larry Bosley, and John Evans, "Analysis of an MCM Implementation for an Automotive Controller," *International Journal of Microcircuits and Electronic Packaging, Vol 20, No. 3, 3rd Qtr., 1997, pp. 325-332.*

R. M. Nelms and R. Wayne Johnson, "200^{o}C Operation of a 500-W DC-DC Converter Utilizing Power MOSFET's," *The IEEE Transactions on Industrial Applications*, Vol. 33, No. 5, 1997, pp. 1267-1272.

Stuart M. Wentworth, Brian L. Dillaman, Jon R. Chadwick, Charles D. Ellis, and R. Wayne Johnson, "Attenuation in Silver-filled Conductive Epoxy Interconnects," *The IEEE Transactions on Components, Packaging and Manufacturing Technology - Part A, Vol. 20, No. 1, 1997, pp. 52-59.*

J. B. Casady and R. W. Johnson, “Status of Silicon Carbide (SiC) as a Wide-Bandgap Semiconductor for High Temperature Applications: A Review,” *Solid -State Electronics*, Vol. 39, No. 10, 1996, pp. 1409-1422.

J. B. Casady, W. C. Dillard, R. W. Johnson, and U. Rao, “A Hybrid, 6H-SiC Temperature Sensor Operational from 25°C to 500°C,” *The IEEE Transactions on Components, Packaging and Manufacturing Technology - Part A*, Vol.19, No. 3, September 1996, pp. 416-422.

J. B. Casady, J. D. Cressler, W. C. Dillard, R. W. Johnson, A. K. Agarwal, and R. R. Siergiej, “DC Characterization of Depletion-Mode 6H-SiC MOSFET’s from 294K to 723K,” *Solid-State Electronics*, Vol. 39, No. 6, June 1996, pp. 777-784.

J. B. Casady, E. D. Luckowski, M. Bozack, D. Sheridan, R. W. Johnson, and J. R. Williams, “Etching of 6H-SiC and 4H-SiC Using NF_3 in a Reactive Ion Etching System,” *Journal of the Electrochemical Society*, Vol. 143, No. 5, May 1996, pp. 1750-1753.

J. B. Casady, W. Dillard, R. W. Johnson, A. K. Agarwal, R. R. Siergiej, and W. E. Wagner, "Low Frequency Noise in 6H-SiC MOSFETs," *IEEE Electron Device Letters*., Vol. 16, No. 6, June 1995, pp. 274-276.

John L. Evans, Larry Bosley, and R. Wayne Johnson, "MCM-L Technology: System Cost Comparisons for High Volume Automotive Electronics," *IEEE Transactions on Components, Hybrids and Manufacturing Technology Part B: Advanced Packaging*, Vol. 18, No. 1, February 1995, pp. 28-32.

Jon Aday, R. Wayne Johnson, John L. Evans, and Chris Romanczuk, "Wire Bonded Thick Film Silver Multilayers for Under-the-Hood Automotive Applications," *The International Journal of Microcircuits and Electronic Packaging*, Vol. 15, No. 3, 1994, pp. 302-311.

Richard C. Jaeger, Jeffrey C. Suhling, Martin T. Carey, and R. Wayne Johnson, "Off-Axis Sensor Rosettes for Measurement of the Piezoresistive Coefficients of Silicon," *IEEE Transactions on Transactions on Components, Hybrids, and Manufacturing Technology*, Vol. 16, No. 8, December 1993, pp. 925-931.

R. Wayne Johnson, G. Bennett Weir, and James R. Bromstead, "200ºC Operation of Semiconductor Power Devices," *IEEE Transactions on Transactions on Components, Hybrids, and Manufacturing Technology*, Vol. 16, No. 7, November 1993, pp. 759-764.

Miro Tomana, R. Wayne Johnson, Richard C. Jaeger, and William C. Dillard, "A Hybrid, Silicon Carbide Differential Amplifier for 350ºC Operation," *IEEE Transactions on Transactions on Components, Hybrids, and Manufacturing Technology*, Vol. 16, No. 5, August 1993, pp. 536-542.

R. E. Beaty, R. C. Jaeger, J. C. Suhling, R. W. Johnson, and R. D. Butler, "Evaluation of Piezoresistive Coefficient Variation in Silicon Stress Sensors Using a Four Point Bending Test Fixture", *IEEE Transactions on Components, Hybrids and Manufacturing Technology*, Vol. 15, No. 5, October 1992, pp. 904-914.

Kevin D. Robb and R. Wayne Johnson, "Analysis of Slot-Fed Microwave Feed Structures Using the Transmission Line Matrix (TLM) Method", *The International Journal of Microcircuits and Electronic Packaging*, Vol. 15, No. 2, Second Quarter 1992, pp. 103-112.

R. Ramesham, T. Roppel, R. W. Johnson, and J. M. Chang, "Characterization of Polycrystalline Diamond Thin Films Grown on Various Substrates, *Thin Solid Films*, Vol. 212, Nos. 1-2, May 1992, pp. 96-103.

R. W. Johnson, E. L. Thomas, R. Duren, D. W. Curington, and A. C. Lippincott , "Insulated Metal Substrates for the Fabrication of a Half-Bridge Power Hybrid", *IEEE Transactions on Components, Hybrids and Manufacturing Technology*, Vol. 14, No. 4, December 1991, pp. 886-893.

D. A. Bittle, J. C. Suhling, R. E. Beaty, R. C. Jaeger, and R. W. Johnson, "Piezoresistive Stress Sensors for Structural Analysis of Electronic Packages", *Journal of Electronic Packaging*, Vol. 113, No. 3, September 1991, pp. 203-214.

Kevin D. Robb, Fred J. German, Stuart M. Wentworth, and R. Wayne Johnson, "Analysis of Microstrip Resistors Using the Transmission Line Matrix (TLM) Method", *International Journal for Hybrid Microelectronics*, Vol. 14, No. 2, June 1991, pp. 62-69.

C. L. Chen, R. Wayne Johnson, R. C. Jaeger, M. B. Cornelius and W. A. Foster, "Packaging Technology for a Low Temperature Astrometric Sensor Array," *IEEE Transactions on Components, Hybrids and Manufacturing Technology* , Vol. 13, No. 4, December 1990, pp. 1083-1089.

F. German and R. Wayne Johnson, "Full Wave Three-Dimensional Simulation of Maxwell's Equations for the Electrical Characterization of High-Speed Interconnects," *IEEE Transactions on Components, Hybrids and Manufacturing Technology,* Vol. 13, No. 2, June 1990, pp. 341-346.

R. Wayne Johnson, T. L. Phillips, K. Weidner, S. F. Hahn, D. C. Burdeaux and P. Townsend, "Benzocyclobutene Interlayer Dielectrics for Thin Film Multichip Modules," *IEEE Transactions on Components, Hybrids and Manufacturing Technology.* Vol. 13, No. 2, June 1990, pp. 347-352.

T. A. Baginski and R. Wayne Johnson, "A Novel RF Insensitive EED Utilizing a Balanced Reactive Bridge," *IEEE Transactions on Electromagnetic Compatibility,* Vol. 32, No. 1, February 1990, pp. 69-73.

R. Wayne Johnson, R. Weeks, D. Hopkins, J. Muir, and J. Williams, "Plated Copper on Ceramic Substrates for Power Hybrid Circuits," *IEEE Transactions on Components, Hybrids and Manufacturing Technology,* Vol. 12, No. 4, December 1989, pp. 530-536.

R. Wayne Johnson, T. L. Phillips, R. C. Jaeger, S. F. Hahn and D. C. Burdeaux, "Multichip Thin Film Technology on Silicon," *IEEE Transactions on Components, Hybrids, and Manufacturing Technology,* Vol. 12, No. 2, June 1989, pp. 185-194.

R. Wayne Johnson, Michael Cornelius, Jimmy L. Davidson and Richard C. Jaeger, "Planar Hybrid Interconnection Technology," *International Journal for Hybrid Microelectronics*, Vol. 10, No. 1, 1st Quarter, 1987.

R. Wayne Johnson, Jim Davidson, Richard Jaeger and David Kerns, "Silicon Hybrid Wafer Scale Package Technology," *IEEE Journal of Solid State Circuits*, October 1986, pp. 845-851.

R. Wayne Johnson, P. W. Rich, D. D. Rich and L. K. Wilson, "Advances in Thick Film Conductors for Microwave Integrated Circuits," *Electro Component Science and Technology*, Vol. 6, Nos. 3 and 4, 1980.

R. Wayne Johnson, Larry Wilson and Donald Kinser, "Characterization of Thermal Compression Wire Bonds to Thick Film Conductors on Porcelain Substrates," *IEEE Transactions on Components, Hybrids and Manufacturing Technology*, Vol. 2, No. 3, September 1979, pp. 288-293.

Refereed Journal Articles (Accepted for publication)

Yida Zou, R. Wayne Johnson, Jeffery C. Suhling, Joe Harris, Cheryl Kromis, Iftikhar Ahmad, Denise Tucker, Zak Fathi, "Die Level Stress with Convection and Variable Frequency Microwave Encapsulant Curing for Chip-on-Board Assembly," submitted to the International Journal of Microcircuits and Electronic Packaging.

Ahsan Mian, Jeffrey C. Suhling, R. Wayne Johnson and Richard C. Jaeger, 'Measurement of Backside Flip Chip Die Stresses Using Piezoresistive Test Die," accepted by the International Journal of Microcircuits and Electronic Packaging.

Refereed Journal Articles (Submitted for publication)

Jeffrey E. Naefe, R. Wayne Johnson, and Richard R. Grzybowski, "High-Temperature Storage and Thermal Cycling Studies of Heraeus-Cermalloy Thick Film and Dale Power Wirewound Resistors," submitted to the IEEE Transactions on Components and Packaging Technologies.

Haiwei Peng, R. Wayne Johnson, George Flowers & Abbey-Gayle Ricketts, Erin Yeager, Mark Konarski, Afranio Torres, and Larry Crane, "Underfilling Fine Pitch BGAs," submitted to the IEEE Transactions on Electronics Packaging Manufacturing.

Yun Zhang, Renzhe Zhao, Daniel K. Harris, and R. Wayne Johnson," A Computational Study On Solder Bump Geometry, Normal, Restoring, And Fillet Forces During Solder Reflow In The Presence Of Liquefied Underfill," submitted to the IEEE Transactions on Electronics Packaging Manufacturing.

Zhenwei Hou, Guoyun Tian, Casey Hatcher, R. Wayne Johnson, Erin Yaeger, Mark Konarski and Larry Crane, "Lead Free Solder Flip Chip-on-Laminate Assembly and Reliability," submitted to the IEEE Transactions on Electronics Packaging Manufacturing.

Claire Estes, Stuart M. Wentworth and R. Wayne Johnson, “Coaxial Transmission Line Technique for Measuring Electronic Packaging Material Dielectric Properties,” submitted to the IEEE Transactions on Advanced Packaging

Invited Lectures

"High Temperature Electronics Packaging", National Research Council Committee on Materials for High-Temperature Semiconductor Devices, Washington D.C., February 10, 1994.

"Silicon Multichip Modules", Multichip Module Seminar - IEEE Society for Components, Hybrids, and Manufacturing Technology, April 13, 1991, San Diego, CA.

“A Review of High Temperature Electronics Packaging,” High Temperature Electronics Workshop, June 1989.

“Thin Film Silicon Hybrids,” VLSI and GaAs Packaging Workshop, September 1988.

Books and Book Chapters

“Hybrid Assembly and Packaging”, R. Wayne Johnson, Chapter 8 in High Temperature Electronics, edited by Randall Kirschman, IEEE Press, 1998.

“Automotive Multichip Modules”, R. Wayne Johnson and John L. Evans, Chapter 15, *Advanced Electronic Packaging*, edited by William D. Brown, IEEE Press, 1998.

“Assembly”, R. Wayne Johnson, Chapter 8 in *Multichip Module Technology Handbook*, edited by Iwona Turlik and Philip Garrou, McGraw-Hill, New York, NY 1997.

"Introduction to Hybrid Microelectronics", R. Wayne Johnson, Chapter 1 in the *Handbook of Hybrid Microelectronics, 2nd Edition*, edited by Jerry Sergent and Charles Harper, McGraw-Hill, Inc., New York, NY, 1994

"Silicon Multichip Modules", R. Wayne Johnson, Chapter 16 in *Multichip Module Technologies and Alternatives - The Basics*, edited by D. A. Doane and Paul Franzon, Van Nostrand Reinhold, New York, NY, 1992.

Multichip Modules: Systems Advantages, Major Constructions, and Materials Technologies, edited by R. Wayne Johnson, Robert Teng, and John Balde, IEEE Press, New York, NY, 1991.

Modular Series in Hybrid Microelectronics, edited by R. Wayne Johnson, The International Society for Hybrid Microelectronics, Reston, VA, 1991.

"Introduction to Hybrid Microelectronics", R. Wayne Johnson, Chapter 1 in Modular Series in Hybrid Microelectronics, edited by R. Wayne Johnson, The International Society for Hybrid Microelectronics, Reston, VA, 1991.

"Wafer-Scale Multichip Packaging Technology", R. Wayne Johnson, Richard C. Jaeger,

and Travis N. Blalock, Chapter 10 in Wafer Scale Integration, edited by Earl E. Swarzlander, Jr., Kluwer Academic Press, Boston, 1989.

Advisory Board

Advanced Packaging, Lake Publishing Corporation, Libertyville, Illinois.

Editorial Board

Associate Editor - *The International Journal of Microcircuits and Electronic Packaging*

Associate Editor - *IEEE Transactions on Components, Packaging, and Manufacturing Technology Part C: Manufacturing*

Papers at Professional Meetings

S. V. Sattiraju , B. Dang , R. W. Johnson , Y. Li, J. S. Smith and M. J. Bozack,"Wetting Characteristics of Pb-free Solder Pastes and Pb-free PWB Finishes," 51st Electronic Components and Technology Conference, Lake Buena Vista, FL. May 29 - Jun 1 2001, S37p12

Renzhe Zhao, Yun Zhang, R. Wayne Johnson, Daniel K. Harris, "A Study of Normal, Restoring, and Fillet Forces and Solder Bump Geometry during Reflow in Concurrent Underfill/Reflow Flip Chip Assembly," 51st Electronic Components and Technology Conference, Lake Buena Vista, FL. May 29 - Jun 1 2001,

Zhenwei Hou, Casey Hatcher, R. Wayne Johnson, Erin Yaeger, Mark Konarski and Larry Crane, "Assembly and Reliability of Flip Chip-on-Laminate with Lead Free Solder," Proceedings of the 2001 HD International Conference, Santa Clara, CA April 18-20, 2001. Received 'Best Paper of Conference' Award.

S.V.Sattiraju, R.W.Johnson, D.Z.Genc and M.J.Bozack, "Wetting Performance of Several Lead-free Board Finishes and Solder Alloys", IPCWorks 2000 Proceedings, Sept 9-14, 2000, Miami pp. S-01-2-1 to S-01-2-12.

S. Sattiraju, R. W. Johnson, D. Genc, and M. J. Bozack, "Wetting Performance vs Flux and Board Finish for Several No-Pb Solder Alloys," 25th International Electronics Manufacturing Technology (IEMT) Symposium, Santa Clara, CA, Oct 2-3, 2000, pp. 253-262.

R. Wayne Johnson, Shannon Pan, Mike Palmer and Robert Dean, "Conductive Adhesives for Under-the-Hood Automotive Applications," the 5th International High Temperature Electronics Conference, June 12-15, 2000, Albuquerque, NM.

Zhenwei Hou, R. Wayne Johnson, Erin Yaeger, Mark Konarski, and Larry Crane, **"**Compatibility of Current Flipchip Process with Lead Free Solder Bumps," Proceedings of the 37th IMAPS Nordic Annual Conference, Helsingør, Denmark, September 10 – 13, 2000, pp. 123-127.

Larry Crane, Afranio Torres, Erin Yaeger and R. Wayne Johnson, "Reworkable Underfill Development, Processing and Reliability," Proceedings of the 3rd Annual HDI Expo, Phoenix, AZ, September 25-27, 2000, pp. 65-70.

R. Wayne Johnson, Shannon Pan, Mike Palmer and Robert Dean, "Conductive Adhesives for Under-the-Hood Automotive Applications," the 5th International High Temperature Electronics Conference, June 12-15, 2000, Albuquerque, NM.

Haiwei Peng, R. Wayne Johnson, George Flowers, Erin Yeager, Mark Konarski, Afranio Torres, and Larry Crane, "Underfilling Micro-BGAs," Proceedings of the International Conference on High-Density Interconnect and Systems Packaging, Denver CO, April 25-28, 2000, pp. 134-140.

Prasanna Kulkarni, R. Wayne Johnson, Erin Yaeger, Mark Konarski, Afranio Torres, Paul Krug and Larry Crane, "Manufacturing of Flip Chip-on-Laminate," Proceedings of the APEX Technical Program, Long Beach, CA, March 12-16, 2000, pp. P-AP3/2/1 – 5.

Ahsan Mian, Jeffrey C. Suhling, R. Wayne Johnson and Richard C. Jaeger, 'Measurement of Backside Flip Chip Die Stresses Using Piezoresistive Test Die," 1999 International Microelectronics Symposium, October 26-28, 1999, Chicago, IL.

Yida Zou, R. Wayne Johnson, Jeffery C. Suhling, Joe Harris, Cheryl Kromis, Iftikhar Ahmad, Denise Tucker, Zak Fathi, "Comparison of Die Level Stress with Convection and Variable Frequency Microwave Encapsulant Curing for Chip-on-Board," Proceedings of the 1999 International High Density Packaging and MCM Conference, Denver, CO, April 6-9, 1999, pp. 77-16. Winner of "Best Paper of Advanced Materials Session Award"

Jing Qi, R. Wayne Johnson, Erin Yaeger, Mark Konarski, Todd Doody, Z. Andrew Szczepaniak and Larry Crane, "Flip Chip on Laminate Manufacturability," Proceedings of the 1999 International High Density Packaging and MCM Conference, Denver, CO, April 6-9, 1999, pp. 345-352. Winner of "Best Paper of Flip Chip Session Award"

R. Wayne Johnson, Vicky Wang, and Michael Palmer, "Thermal Cycle Reliability of Solder Joints to Alternate Plating Finishes," Proceedings of the 1998 Surface Mount International Conference, San Jose, CA, August 25-27, 1998.

C. S. White, R. M. Nelms, R. W. Johnson, and R. R. Grzybowski, "High Temperature Electronic Systems Using Silicon Semiconductors," Conference Record of the 1998 Industry Applications Society Thirty-Third IAS Annual Meeting, Vol. 2, October 1998, pp. 967-976.

Jeffrey E. Naefe, R. Wayne Johnson, and Richard R., Grzybowski,"High-Temperature Storage and Thermal Shock Studies of Passive Component Attach Materials, Proceedings of the 4th International High Temperature Electronics Conference, Albuquerque, NM, June 16-19, 1998, pp. 68-78.

Jeffrey E. Naefe, R. Wayne Johnson, and Richard R.Grzybowski, "High-Temperature Storage and Thermal Cycling Studies of Heraeus-Cermalloy Thick Film and Dale Power Wirewound

Resistors," Proceedings of the 4th International High Temperature Electronics Conference, Albuquerque, NM, June 16-19, 1998, pp. 191-206.

Jay S. Salmon, R. Wayne Johnson, and Mike Palmer , "Thick Film Hybrid Packaging Techniques for 500°C Operation," Proceedings of the 4th International High Temperature Electronics Conference, Albuquerque, NM, June 16-19, 1998, pp. 103-108.

R. Wayne Johnson, M. Albert Capote, Sherry Zhu, Ligui Zhou, and Bing Gao , "Reflow-Curable Polymer Fluxes for Flip Chip Encapsulation," Proceedings of the International Conference and Exhibition on Multichip Modules and High Density Packaging, Denver, CO, April 15-17, 1998, pp. 41-46..

R. Wayne Johnson, Michael Palmer, Michael Bozack and Tamara Issac-Smith, "Thermosonic Gold Wire Bonding to Palladium Finishes on Laminate Substrates," Proceedings of the International Conference and Exhibition on Multichip Modules and High Density Packaging, Denver, CO, April 15-17, 1998, pp. 291-299.

Y. Zou, Jeffery Suhling, R. Wayne Johnson, and R. C. Jaeger, Complete Stress State Measurements in Chip on Board Packages," Proceedings of the International Conference and Exhibition on Multichip Modules and High Density Packaging, Denver, CO, April 15-17, 1998, pp. 405-415.

R. Wayne Johnson, M. Albert Capote, Z. Ming Zhou, Sheery Chu, and Ligui Zhou, "Reflow-Curable Polymer Fluxes for Flip Chip Assembly," Proceedings of Surface Mount International Technical Program, San Jose, CA September 7-11, 1997, pp. 267-272.

S. T. Lin, J. C. Suhling, R. W. Johnson, B. Han, and J. L. Evans, "Finite Element and Moire Interferometry Study of Chip Capacitor Reliability, " InterPACK '97, Hawaii, June 15-19, 1997.

John L. Evans, Robert Newberry, Larry Bosley, Steven G. McNeal, Andrew Mawer, R. Wayne Johnson, and Jeff Suhling, "PBGA Reliability for Under-the-Hood Automotive Applications," InterPACK '97, Hawaii, June 15-19, 1997.

R. Wayne Johnson, "The Student Factory at Auburn University," Proceedings of the 47th Electronic Components and Technology Conference, San Jose, CA, May 19-21, 1997, pp. 589-592.

J. Naefe, M. Palmer, M. Lankford, and W. Johnson, "High Temperature Characterization of Heraeus-Cermalloy Thick Film and Dale Power Wirewound Resistors," Proceedings of the 17th Capacitor and Resistor Technology Symposium, Jupiter Beach, FL, March 24-27, 1997, pp 244-250.

R. Wayne Johnson, David Price, Dan Maslyk, Michael Palmer, Stuart Wentworth, Charles Ellis, John Czarnowski and Justin Bolger, "Adhesive Based Flip Chip Technologies for Assembly on Polyimide Flex Substrates," Proceedings of the 1997 International Conference on Multichip Modules, Denver, CO, April 2-4, 1997, pp. 81-86, Best Paper of Session Award.

Chris Dunn, R. Wayne Johnson, Mike Bozack, Cheryl Kromas, Joe Harris, and Marnie Knadler, "Thermosonic Gold Ball Bonding to Alternate Plating Finishes on Laminate MCM

Substrates," Proceedings of the 1997 International Conference on Multichip Modules, Denver, CO, April 2-4, 1997, pp. 170-176, Best Paper of Session Award.

Marcus Lankford, Kyle Davis, R. Wayne Johnson, M. E. Baginski, and Hayden Hontgas, "Investigation of Design and Performance of Multichip Modules Including Electromagnetic Compatibility," Proceedings of the 1997 International Conference on Multichip Modules, Denver, CO, April 2-4, 1997, pp. 187-192.

Robert Newberry, Larry Bosley and R. Wayne Johnson, "A Comparative Analysis of a MCM Implementation for an Automotive Controller," Proceedings of the 1997 International Conference on Multichip Modules, Denver, CO, April 2-4, 1997, pp. 323-328.

Brian L. Dillaman, Stuart M. Wentworth, and R. Wayne Johnson, "Attenuation and Reliability of Conductive Adhesive Interconnects," Proceedings of the 1996 Electronics Packaging Conference, Austin, TX, Sept. 29-Oct. 1, 1996, pp. 130-139.

John M. Czarnowski, Mark E. S. Reynolds, Justin C. Bolger, Matthew T. Hayes, Charles D. Ellis, R. Wayne Johnson, and Michael J. Palmer, "Evaluation of Area Bonding Conductive Adhesives for Flip Chip Attach of Area Bonded Die," Proceedings of the 1996 International Electronics Manufacturing Technology Symposium, Austin, TX, Oct. 14-16, 1996, pp. 476-481.

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R. Wayne Johnson, Michael Cornelius, Jimmy L. Davidson and Richard C. Jaeger, "Planar Hybrid Interconnection Technology," *Proceedings of the 1986 International Symposium on Microelectronics*, October 1986, Best Paper of Session Award, pp. 758-765.

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SHORT COURSES

Hybrid Microelectronics: This five day course provides a hands-on discussion of thick film, thin film and cofired ceramic substrate technologies, bare semiconductor assembly and packaging methods and surface mount technology. The students fabricated a pulse generator using thick film, chip-and-wire technology as part of the course.

Semiconductor Fabrication: This five-day course covers the basic semiconductor fabrication processes and materials. In the laboratory, the students fabricate N-MOS transistor designs.

Multichip Module Fundamentals: This one day course discusses the materials and processes for fabrication and assembly of multichip modules along with a discussion of design issues.

Area Array Assembly: Flip Chip, Chip Scale Package and Ball Grid Array: This one day course describes the various area array packaging options and the assembly materials and processes for their use.

Packaging for High Temperature: This one-half day courses explores the issues associated with packaging electronics for operating temperatures ranging from 200^{o}C to 500^{o}C.

UNITED NATIONS DEVELOPMENT PROGRAM

Served as Expert in MultiChip Module Technology during two visits (4 weeks in 1993 and 2 weeks in 1995) to Telebras CPqD in Campinas, Brazil. Worked in research laboratories and taught short course during visits.

Patents

"Automotive Electronics Test System" with Neil Borkowicz, David Muir, and John Evans of Chrysler Corporation, Patent Number 543813, issued August 1, 1995.

PROFESSIONAL ORGANIZATIONS

International Society for Hybrid Microelectronics (ISHM)

- Technical Vice President 2000-2002
- Vice President for information Dissemination 1997-1999
- Chairman of the Publications Committee 1997-1999
- Technical Chair for the Flip Chip Advanced Technology Workshop 1999
- Daniel C. Hughes Memorial Award, 1997
- Fellow of the Society, 1994
- John A. Wagnon Jr., Technical Achievement Award, 1993
- First Past-President 1992
- President 1991
- President-Elect 1990
- Southeast Regional Director 1987-1989
- Chairman Executive Committee 1991
- Awards Committee Chair 1992
- Chair General for the 8th International Conference on Multichip Modules 1998
- Co-Chair General for the 7th International Conference on Multichip Modules 1997
- General for the 3nd International Conference on Multichip Modules 1994
- Co-Chair General for the 2nd International Conference on Multichip Modules 1993
- Technical Co-Chair for the 1st International Conference on Multichip Modules 1992

Session Chairman for the International Conference on Multichip Modules 1994, 1995, 1996
Technical Chairman for the Automotive Advanced Technology Workshop 1996
Session Chair for the MCM Advanced Technology Workshop 1990 and 1991
Faculty Advisor for Auburn University Student Chapter of ISHM 1987-Present
Associate Editor for the ISHM International Journal of Microcircuits and Electronic Packaging, 1995, 1996, 1997, 1998
Editor of the International Journal for Hybrid Microelectronics 1980-1982
Publication Committee Chairman 1980-1982
Member of National Technical Committee 1993, 1994, 1995, 1996
Chairman of the Packaging Subcommittee (NTC) 1994, 1995
Session Chairman at ISHM Symposiums 1982, 1983, 1984, 1995, and 1996
President Tennessee Valley Chapter 1983 and 1987
President-Elect Tennessee Valley Chapter 1982
Vanderbilt Student Chapter President 1979, 1981

Institute of Electrical and Electronics Engineers (IEEE), Senior Member 1994,
Components, Hybrids, and Manufacturing Technology Society
Board of Govenors, 1994-1997

Surface Mount Technology Association, member 1994-present

IPC, Auburn representative 1998-present

Interconnection Technology Research Institute, ITRI, Auburn representative 1999-present

International Electronic Packaging Society (IEPS)
Board of Directors, 1994-1996
Vice President for Publications, 1995-1996
Nominations Committee, 1995

Eta Kappa Nu
Tau Beta Pi
Kentucky Colonel