Joseph B. Bernstein

Professor, School of Engineering
University of Maryland
Bar Ilan University
Ramat Gan, Israel

PERSONAL INFORMATION

Education:

Ph.D. Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1990

E.E. Electrical Engineer degree, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1987

M.S. Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1986

B.S. Bachelor of Science with honors in Electrical Engineering, Summa Cum Laude, Union College, Schenectady, New York, 1984

Employment History:

2007 - Present Professor, School of Engineering, Bar Ilan University, Israel

2001 - 2008 Associate Professor, Mechanical Engineering Department, University of Maryland, College Park, Maryland

2003 - 2005 Visiting Associate Professor of Engineering, Faculty of Engineering, Tel-Aviv University, Israel. **Fulbright Senior Scholar**, 2004-2005

1997- Present Affiliate Professor, Electrical Engineering Department, University of Maryland, College Park, Maryland

1997- Present Affiliate Professor, Institute for Plasma Research, University of Maryland, College Park, Maryland

1995- 2001 Assistant Professor of Reliability, Materials and Nuclear Engineering Department, University of Maryland, College Park, Maryland

1991-1993 Adjunct Professor, Boston University, Boston, MA

1990-1995 Research Staff, MIT Lincoln Laboratory, Lexington, MA

Laboratory and Programmatic Affiliations:

Director and Founder: Center for Reliable Electronic Systems at Bar-Ilan University, in collaboration with ILTAM, Israeli industry and University of Maryland.

Assoc. Director: University Research Institute for Nanoscience and Nanotechnology at Tel-Aviv University. (2003-2005)

Director: Microelectronics Device Reliability Laboratory, University of Maryland.

Director: Laboratory for Laser Processing of Microelectronic Devices.

RESEARCH, SCHOLARLY, AND CREATIVE ACTIVITIES

Book Authorship and Editorship (chronological order):

1. Hoang, H.H., Schutz, R., Bernstein, J.B., Vasquez, B., *Multilevel Interconnection: Issues that Impact Competitiveness*, Proceedings of SPIE 2090, 1993

2. Pecht, M., Bernstein, J.B., Searls, D., and Peckerar, M., *The Korean Electronics Industry*, CRC Press, 1997.

3. Mark White, Joseph B. Bernstein, *Microelectronics Reliability Modeling and Lifetime Evaluation Handbook: Derating and Reliability Prediction Guidelines*, NASA JPL Publication, 2007

4. Joseph B. Bernstein et.al, *Physics-of-Failure Based Handbook of Microelectronic Systems,* Reliability Information Analysis Center, Utica, NY, 2008
   ISBN-10: 1-933904-29-1

Book Chapters:

1. Stark, B., Bernstein, J.B., " Reliability Overview," *MEMS Reliability Assurance Guidelines for Space Applications*, NASA Publication, 1998

2. Bernstein, J.B., "Laser Link-Making," in *LIA Handbook of Laser Materials Processing*, Magnolia Publishing, 2001.

Articles in Refereed Journals:

1. Bernstein, J.B., “Analysis of the electrically stimulated acoustic-wave method for observing space charge in semi-insulating films," *Physical Review B (Condensed Matter)*, vol.44, no.19, pp. 10804-14 (1991)

2. Bernstein, J.B., Cooke, C.M., "Bulk space charge behavior in polymethylethacrylate under an imposed virtual cathode condition," *IEEE Transactions on Electrical Insulation*, vol. 26, no. 6, pp. 1080-6 (1991)

3. Bernstein, J.B., Cooke, C.M., "Electric poling behavior of polymethylmethacrylate," *IEEE Transactions on Electrical Insulation*, vol. 26, no. 6, pp. 1087-93 (1991)

4. Cohen, S.S., Wyatt, P.W., Bernstein, J.B., “Laser-induced melting of thin conducting films. II. Heat-dissipating substrates," *IEEE Transactions on Electron Devices*, vol.38, no.9 pp. 2051-7 (1991)

5. Cohen, S.S., Wyatt, P.W., Burns, J.A., Bernstein, J.B., “The mechanism of laser-induced vertical links," *Journal of the Electrochemical Society*, vol.138, no.10, pp. 3013-18 (1991)

6. Bernstein, J.B., "Improvements to the Electrically Stimulated Acoustic Wave method for analyzing bulk space charge," *IEEE Transactions on Electrical Insulation*, vol. 27, no.1, pp. 152-61 (1992)

7. Bernstein, J.B., Cohen, S.S., Wyatt, P.W., "Metal wire cutting by repeated application of low-power laser pulses," *Review of Scientific Instruments*, vol. 63, no. 6, pp. 3516-18 (1992)

8. Cohen, S.S., Bernstein, J.B., Wyatt, P.W., "The effect of multiple laser pluses on damage to thin metallic films," *Journal of Applied Physics*, vol. 71, no. 2, pp. 630-7 (1992)

9. Cohen, S.S., Bernstein, J.B., Wyatt, P.W., "Laser-induced line melting and cutting," *IEEE Transactions on Electron Devices*, vol. 39, no. 11, pp. 2480-5 (1992)

10. Murguia, J.E., Bernstein, J.B., "Short-time failure of metal interconnect caused by current pulses," *IEEE Electron Device Letters*, vol. 14, no. 10, pp. 481-3 (1993)

11. Bernstein, J.B., Ventura, T.M., Radomski, A.I., "High-density laser linking of metal interconnect," *IEEE Transactions on Components, Packaging and Manufacturing Technology*, Part A, vol. 17, no.4, pp. 590-3 (1994)

12. Bernstein, J.B., Ventura, T.M., Radomski, A.T., "Laser induced microfracture leading to high density metal-to-metal connections," *Proceedings of the SPIE, The International Society for Optical Engineering*, vol. 2335, pp. 165-76 (1995)

13. Bernstein, J.B., Colella, B.D., "Laser-formed metallic connections employing a lateral link structure," *IEEE Transaction on Components, Packaging, and Manufacturing Technology*, Part A, vol. 18, no. 3, pp.690-2 (1995)

14. Shen, Y-L, Suresh, S., Bernstein, J.B., "Laser linking of metal interconnect: analysis and design considerations," *IEEE Transactions on Electron Devices*, vol. 43, no. 3, pp. 402-10 (1996)

15. *Rasera, R.L.*, Bernstein, J.B., "Laser linking of metal interconnect: linking dynamics and failure analysis," *IEEE Transactions on Components, Packaging, and Manufacturing Technology*, vol. 19, no. 4, pp. 554-61 (1996)

16. Bernstein, J.B., Hua, Y., Zhang, W., "Laser energy limitation for buried metal cuts," *IEEE Electron Device Letters*, vol. 19, no. 1, pp. 4-6 (1998)

17. Bernstein, J.B., Zhang, W., Nicholas, C.H., "Laser formed metallic connections," *IEEE Transactions on Components, Packaging, and Manufacturing Technology, Part B: Advanced Packaging*, vol. 21, no. 2, pp. 194-8 (1998)

18. *Chen, Y.*, Suehle, J.S., Shen, C.C., Bernstein, J.B., Messick, C., Chaparala, P., "A new technique for determining long-term TDDB acceleration parameters of thin gate oxides," *IEEE Electron Device Letters*, vol. 19, no. 7, pp. 218-21 (1998)

19. *Zhang, W.,* Lee, J.H., Chen, Y., Bernstein, J.B., Suehle, J.S., "Reliability of laser-induced metallic vertical links," *IEEE Transactions on Advanced Packaging*, vol. 22, no.4, pp. 614-19 (1999)

20. *Shen, C.C.,* Hefner, A.R., Jr., Berning, D.W., Bernstein, J.B., "Failure Dynamics of the IGBT During Turn-off For Unclamped Inductive Loading Conditions," *IEEE Transactions on Industry Applications*, Vol. 36, no.2, pp.614-24 (2000)

21. Bernstein, J.B., Lee, J., Yang, G., Dahmas, T., "Analysis of Laser Metal-Cut Energy Process Window," *IEEE Transactions on Semiconductor Manufacturing*, vol.13, no. 2, pp. 228-34 (2000)

22. Vogel, E., Suehle, J.S., Edelstein, M.D., Wang, B., *Chen, Y.,* Bernstein, J.B., "Reliability of Ultra-thin Silicon Dioxide Under Combined Substrate Hot Electron and Constant Voltage Tunneling Stress," *IEEE Transactions on Electron Devices*, vol. 47, no.6, pp.1183-91 (2000)

23. *Lee, J., Zhang, W.,* Bernstein, J.B., "Scalability Study of Laser-induced Vertical Make-link Structure," *IEEE Transactions on Semiconductor Manufacturing*, vol. 13, no. 4, pp. 442-447 (2000)

24. *Yang, L.*, Bernstein, J.B., Chung, K, "The Impact of Lead-free Soldering on Electronics packages," *Microelectronics International*, vol. 18, no. 3, pp. 20-26 (2001)

25. *Wang, B.,* Suehle J.S. ,Vogel E.M., Bernstein, J.B., "Time-Dependent Breakdown of Ultra-thin SiO_2 Gate Dielectrics under Pulsed Biased Stress," *IEEE Electron Device Letters*, vol. 22, no. 5, pp. 224-226 (2001)

26. *Zhang, W., J.-H. Lee*, Bernstein, J.B, "Energy Effect of the Laser Induced Vertical Metallic Link," *IEEE Transactions on Semiconductor Manufacturing*, vol. 14, no. 2, pp. 163-169 (2001)

27. J.F. Conley Jr., J.S. Suehle, A.H. Johnston, B.Wang, T. Miyahara, E.M. Vogel, J.B. Bernstein, "Heavy-Ion Induced soft breakdown of thin gate oxides," *IEEE Transactions on Nuclear Science*, vol. 48, no. 6, pp. 1913-16 (Dec. 2001)

28. J.S. Suehle, E.M. Vogel, P. Roitman, J.F. Conley Jr., A.H. Johnston, *B. Wang*, J.B. Bernstein, and C.E. Weintraub, "Observation of Latent Reliability Degradation in Ultra-Thin Oxides after Heavy-Ion Irradiation," *Applied Physics letters*, vol. 80, no. 7, pp. 1282-4 (18 Feb 2002)

29. E.M., Vogel, D. Heh, J.B. Bernstein, "Interaction between low-energy electrons and defects created by hot holes in ultrathin Silicon Dioxide," *Applied Physics letters*, vol. 80, no. 18, pp. 3343-5 (6 May 2002)

30. *L.-S. Yang* and J.B. Bernstein, "Encapsulation Process Development for Flexible-Circuit Based Chip Scale Packages," *IEEE Trans. Electronics Packaging Manufacturing*, vol. 25, no. 4, pp. 344-354 (October 2002)

31. *L.-S. Yang*, J.B. Bernstein and K.C. Leong, "Effect of the Plasma Cleaning Process on Plastic Ball Grid Array Package Assembly Reliability," *IEEE Trans. Electronics Packaging Manufacturing*, vol. 25, no. 2, pp. 91-99 (April 2002)

32. E.M., Vogel, D. Heh, J.B. Bernstein, J.S. Suehle, "Impact of the Trapping of Anode Holes in Silicon Dioxide Breakdown," *IEEE Electron Device Letters*, vol. 23, no. 11, pp. 667-669 (November 2002)

33. *J. Lee, W. Zhang*, J.B Bernstein, "Analysis of Energy Process Window of Laser Metal Pad Cut Link Structure," *IEEE Transactions on Semiconductor Manufacturing*, vol. 16, no. 2, pp. 299-307 (2003)

34. *L. Yang*, C.K. King, J.B. Bernstein, "Liquid Dispensing Encapsulation in Semiconductor Packaging," *Microelectronics International*, vol. 20, no. 3, pp. 29-35 (2003)

35. *D.W. Heh*, E.M. Vogel, J.B. Bernstein, "Impact of Substrate Hot Hole Injection on Ultra-thin Silicon-dioxide Breakdown, "*Applied Physics Letters*, vol. 82, no. 19, pp. 3242-3244 (2003)

36. J.S. Suehle, B. Zhu, Y. Chen and J.B. Bernstein, "Detailed study and projection of hard breakdown evolution in ultra-thin gate oxides," *Microelectronics Reliability,* vol. 45, pp. 419-426 (2005)

37. Joseph B. Bernstein, Moshe Gurfinkel, Xiaojun Li, Jörg Walters, Yoram Shapira and Michael Talmor, "Electronic circuit reliability modeling," *Microelectronics Reliability,* vol. 46, pp. 1957-1979 (2006)

38. *Heh D*, Young CD, Brown GA, Hung PY, Diebold A, Bersuker G, Vogel EM, Bernstein JB, "Spatial distributions of trapping centers in HfO2/SiO2 gate stacks," *Applied Physics Letters,* vol. 88, no.15, pp. 152907 (2006)

39. *X. Li, J. Qin, B. Huang, X. Zhang*, and J.B. Bernstein, "SRAM Circuit Failure Modeling and Reliability Simulation with SPICE," IEEE *Trans. on Device and Mat. Rel.*, vol. 6, no. 2, pp.235-246 (2006)

40. *X. Li, J. Qin, B. Huang, X. Zhang*, and J.B. Bernstein, "A New SPICE Reliability Simulation Method for Deep Submicron VLSI Circuits," IEEE *Trans. on Device and Mat. Rel.*, vol. 6, no. 2, pp. 247-257 (2006)

41. *D. Heh*, C.D. Young, G.A. Brown, P.Y. Hung, A. Diebold, E. Vogel, J.B. Bernstein, and G. Bersuker, "Spatial Distributions of Trapping Centers in $Hf0_2/SiO_2$ Gate Stack," *IEEE Transactions on Electron Devices*, vol. 54, no.6, pp. 1338-45 (2007)

42. *X. Li, J. Qin,* and J.B. Bernstein, "Compact Modeling of MOSFET Wearout Mechanisms for Circuit-Reliability Simulation," IEEE *Trans. on Device and Mat. Rel.*, vol. 8, no. 1, pp. 98-121 (2008)

43. *M. Gurfinkel, H.D. Xiong, K.P. Cheung, J.S. Suehle,* J.B. Bernstein*, Y. Shapira, A.J. Lelis, D. Habersat, N. Goldsman,* "Characterization of Transient Gate Oxide Trapping in SiC MOSFETs Using Fast I-V Techniques," *IEEE Transactions on Electron Devices*, vol. 55, no.8, pp. 2004-12 (2008)

44. L. Yang, J.B. Bernstein, "Reliability Study of High-Density EBGA Packages Using the Cu Metallized Silicon," *IEEE Transaction on Components and Packaging Technology*, vol. 31, no. 3, pp. 702-11 (2008)

Refereed Conference Proceedings (chronological order):

1. Bernstein, J.B., Bahl, S., Schlecht, M.F., "A Low Capacitance Power MOSFET With an Integral Gate Driver," *Proceeding of the 18th Annual IEEE Power Electronics Specialists Conference*, PESC vol. 87, pp. 704, 61-8 (Virginia 1987)

2. Cooke, C.M., Wright, K.A., Takasu, N., Bernstein, J.B., Gollin, E., "Calibration of Volume Charge Measurements By Use of Electron Beam Implantation," *1989 Annual Report. Conference on Electrical Insulation and Dielectric Phenomena*, pp. 508, 435-41 (Virginia 1989)

3. Bernstein, J.B., Cohen, S.S., Wyatt, P.W., "Fatigue of aluminum films leading to melting by multiple laser pulses," *Phase Formation and Modification by Beam-Solid Interactions Symposium*,MRS pp. 589-93 (Boston 1991)

4. Bernstein, J.B., Gleason, E.F., Wyatt, P.W., "A thermally stable silicon rich amorphous silicon nitride alloy for electronic device applications," *Amorphous Silicon Technology Symposium*, MRS pp. 667-72 (California 1992)

5. Bernstein, J.B., Gleason, E.F., Wyatt, P.W., "High density metal cross-point laser linking," *International Conference on Wafer Scale Integration Proceedings*, pp. 176-81 (California 1992)

6. Bernstein, J.B., Gleason, E.F., Wetsel, A.E., Liu, E.Z., Wyatt, P.W., "Anomalous Behavior of Semi-insulating Silicon Rich Amorphous Silicon Nitride," *Amorphous Insulating Thin Films Symposium*, MRS pp. 113-18 (Massachusetts 1993)

7. Bernstein, J.B., "Dielectric fracture leading to metallic connections employing a lateral link structure," *Thin Films: Stresses and Mechanical Properties V. Symposium*, MRS pp. 833-7 (Massachusetts 1994)

8. Bernstein, J.B., Ventura, T.M., Radomski, A.T., "Laser induced microfracture leading to high density metal-to-metal connections," *Proceedings of the SPIE, The International Society for Optical Engineering,* pp. 165-76 (Texas 1994)

9. Bernstein, J.B., "Laser Formed Lateral Metallic Connections," *Proceedings of the Second International Conference on Beam Processing of Advanced Materials*, pp. 101-104 (Ohio 1995)

10. Chen, Y., Suehle, J.S., Shen, C.C., Bernstein, J.B., Messick, C., "A New Technique to Extract TDDB Acceleration Parameters from Fast Qbd Tests," *Proceedings of International Integrated Reliability Workshop*, pp. 67-69, (Nevada 1997)

11. Chen, Y., Suehle, J.S., Shen, C.C., Bernstein, J.B., Messick, C., Chaparala, P., "The correlation of highly accelerated Q_{bd} tests to TDDB life tests for ultra-thin gate oxides," *1998 IEEE International Reliability Physics Symposium Proceedings. 36thAnnual*, pp. 87-91 (California 1998)

12. Bernstein, J.B., Zhang, W., Nicholas, C.H., "Laser formed connections for programmable wiring," *Proceedings of the IEEE 1998 Custom Integrated Circuits Conference*, pp. 608, 163-5 (California 1998)

13. Bernstein, J.B., Zhang, W., Nicholas, C.H., "Laser programmable metallic vias," *Proceedings of the IEEE 1998 International Interconnect Technology Conference*, pp. 304, 205-7 (New York 1998)

14. Chen, Y, Suehle, J.S., Shen, C.C., Bernstein, J.B., Messick, C., Chaparala, P., "The correlation of highly accelerated Q_{bd} tests to TDDB life tests for ultra-thin gate oxides," *1998 IEEE International Reliability Physics Symposium Proceedings. 36th Annual*, pp. vii+421, 87-91 (Nevada 1998)

15. Shen, C.C., Kefner, A.R., Jr., Berning, D.W., Bernstein, J.B., "Failure dynamics of the IGBT during turn-off for unclamped inductive loading conditions," *Conference Record of 1998 IEEE Industry Applications Conference*, p. 3, vol. xxx+2410, 831-9, vol. 2 (New York 1999)

16. Zhang, W., Bernstein, J.B., "Electromigration simulation under DC/AC stresses considering microstructure," *Proceedings of the IEEE 1999 International Interconnect Technology Conference*, pp. 295, 41-3 (California 1999)

17. Suehle, J.S., Vogel, E., Wang, B., Bernstein, J.B., "Temperature Dependence of Soft Breakdown and Wear-Out in Sub-3 nm SiO_2 Films," *International Reliability Physics Symposium - Conference Proceedings*, pp. 33-9 (California 2000)

18. E. M. Vogel, M. D. Edelstein, C. A. Richter, N. V. Nguyen, I. Levin, D. L. Kaiser, H. Wu, and J. Bernstein, "Issues in High-κ Gate Dielectrics for Future MOS Devices", *Proceedings of IEEE Microelectronics Reliability Qualification Workshop* (California 2000)

19. B. Wang, J. Suehle, E.M. Vogel, J.B. Bernstein, "The Effect of Stress Interruption and pulsed bias stress on Ultra-Thin Gate Dielectric Reliability," *Proceedings of Integrated Reliability Workshop* (California 2000)

20. J. Lee, G. Zhuo and J.B. Bernstein, "Laser Programmable Multichip Module using Vertical Make-link," *Proceedings of the IEEE Electronic Components and Technology Conference*, pp 932-936 (Nevada 2000)

21. Vogel, E., Suehle, J.S., Edelstein, M.D., Wang, B., Chen, Y., Bernstein, J.B., "Degradation of Ultra-thin SiO_2 Under Combined Substrate Hot Electron and Tunneling Stress," *Semiconductor Interface Specialists Conference*, (California 2000)

22. J.S. Suehle, et.al … J.B. Bernstein, "Challenges of high-k gate dielectrics for future MOS devices," *6th International Symposium on Plasma and Process Induced Damage*, pp. 90-93 (California 2001)

23. B. Wang, J.B. Bernstein, "Latent Reliability Degradation of Ultra-Thin Oxides After Heavy Ion and Gamma Irradiation," *Proceedings of Integrated Reliability Workshop* (California 2001)

24. Bernstein, J.B. and Lee, J, "A Laser Formed MakeLink for Customization and Repair," *Proceedings of IEEE International Symposium on Semiconductor Manufacturing,* pp. 347-350 (California 2001)

25. Z. Gao, J. Luo, Hu Huang, W. Zhang, J.B. Bernstein, "Reliable laser programmable gate array technology," *Proceedings of International Symposium on Quality Electronic Design*, pp. 252-256 (Califorinia 2002)

26. Ji Luo, K. Chung, Hu Huang, J.B. Bernstein, "Comparison of Silicon Carbide Schottky diodes," *Proceedings of 2001 GaAs Reliability Workshop* (Virginia 2001)

27. Ji Luo, Kuan-Jung Chung, Hu Huang, J.B. Bernstein, "Temperature Dependence of R(on,sp) in Silicon Carbide and GaAs Schottky diodes," *Proceedings of IEEE International Reliability Physics Symposium*, 40th annual (New Jersey 2002)

28. Zhuo Gao, Ji Luo, Hu Huang, Wei Zhang, J.B. Bernstein, "Reliable laser programmable gate array technology," *Proceedings International Symposium on Quality Electronic Design*, p. 252-6, Los Alamitos (California 2002)

29. D. Heh, J.B. Bernstein, E.M. Vogel, "Defect generation in ultra-thin oxide over large fluence ranges," *Proceedings of Integrated Reliability Workshop*, Lake Tahoe (Nevada 2002)

30. X. Zhang, N. Goldsman, J.B. Bernstein, J.M. McGarrity, “Numerical and Experimental Characterization of 4H-SiC Schottky Diodes,” *Proceedings of IEEE International Semiconductor Device Research Symposium*, p. 120-1 (2003)

31. M. White, M. Cooper, Y. Chen, J. Bernstein, "Impact of Junction Temperature on Microelectronic Device Reliability and Considerations for Space Applications," *Proceedings of Integrated Reliability Workshop*, p. 133-6 (Nevada 2003)

32. B. Zhu, J.B. Bernstein, J. Suehle, "Negative bias temperature instability of deep sub-micron p-MOSFETs under pulsed bias stress," *Proceedings of Integrated Reliability Workshop*, pp. 125-9 (Nevada 2003)

33. Y. Chen, D. Nguyen, S. Guertin, J.B. Bernstein, M. White, R. Menke, S. Kayali, "A Reliability Evaluation Methodology for Memory Chips for Space Applications when Sample Size is Small," *Proceedings of Integrated Reliability Workshop*, Lake Tahoe (Nevada 2003)

34. B. Zhu, J.S. Suehle, J.B. Bernstein, "Mechanism for reduced NBTI effect under pulsed bias stress conditions," *Proceedings of Integrated Reliability Workshop*, Phoenix (Arizona 2004)

35. J.S. Suehle, B. Zhu, Y. Chen, J.B. Bernstein, "Acceleration factors and mechanistic study of progressive breakdown in small area ultra-thin gate oxides," *Proceedings of Integrated Reliability Workshop*, Phoenix (Arizona 2004)

36. Ji Luo; *Bernstein*, *J.B*.; Tuchman, J.A.; Hu Huang; "A high performance radiation-hard field programmable analog array." *Proceedings. 5th International Symposium on Quality Electronic Design.* p. 522-7. (Los Alamitos, CA, 2004)

37. Hu Huang, Joseph B. Bernstein, Martin Peckerar, Ji Luo; "Combined Channel Segmentation and Buffer Insertion for Routability and Performance Improvement of Field Programmable Analog Arrays," *Proceedings of the IEEE International Conference on Computer Design* (October 2004)

38. Xiaojun Li; Walter, J.D.; Bernstein, J.B.; "Simulating and Improving Microelectronic Device Reliability by Scaling Voltage and Temperature," *Quality of Electronic Design, 2005. ISQED 2005. Sixth International Symposium*, pp.496 - 502 (March 2005)

39. Xiaojun Li; Huang, B.; Qin, J.; Zhang, X.; Talmor, M.; Gur, Z.; Bernstein, J.B.; "Deep Submicron CMOS Integrated Circuit Reliability Simulation with SPICE," *Quality of Electronic Design, 2005. ISQED 2005. Sixth International Symposium on*, pp. 382 - 389 (March 2005)

40. Zhu, B.; Suehle, I.S.; Vogel, E.; Bernstein, J.B.; "The contribution of HFO_2 bulk oxide traps to dynamic NBTI in pMOSFETs," *IEEE International Reliability Physics Symposium 2005 Proceedings*, pp. 533 – 537 (April 2005)

41. Kuan-Jung Chung; Bernstein, J.B.; Ji Luo; Tuchman, J.A.; Ma, Z.K.; "Experimental Study for Low Resistance Interline Connections Using Pulsed Laser Techniques," *Quantum Electronics and Laser Science 2005*, Conference Volume 3, pp.1564 - 1566 (May 2005)

42. Bing Huang; Xiaojun Li; Ming Li; Bernstein, J.; Smidts, "Study of the impact

of hardware fault on software reliability," Proceedings. 16th IEEE International Symposium on Software Reliability Engineering. Chicago, IL, USA (Nov. 2005)

43. M. Gurfinkel, J. Suehle, J.B. Bernstein, Y. Shapira, A.J. Lelis, D. Habersat, N. Goldsman, "Ultra-Fast Measurement of Vth Instability in SiC MOSFETs due to Positive and Negative Constant Bias Stress", 2006 *International Integrated Reliability Workshop* (IIRW) Final Report, pp. 49-53 (October 2006).

44. M. White, C. Vu, C. Nguyen, R. Ruiz, Y. Chen, J.B. Bernstein, "Product Reliability Trends, Derating Considerations and Failure Mechanisms with Scaled CMOS," 2006 *International Integrated Reliability Workshop* (IIRW) Final Report, pp. 156-159 (October 2006).

45. J. Qin, J.B. Bernstein, "Non-Arrhenius Temperature Acceleration and Stress-Dependent Voltage Acceleration for Semiconductor Devices Involving Multiple Failure Mechanisms," 2006 *International Integrated Reliability Workshop* (IIRW) Final Report, pp. 93-97 (October 2006).

46. Bernstein, J. B., "Reliability Qualification at the Maryland-Israel Center for Product Realization," Proceedings of 16th International Conference of the Israel Society for Quality, pp. 9.2.01 Tel Aviv (November 2006).

47. M. Gurfinkel, J. Suehle, J.B. Bernstein, Y. Shapira, "Enhanced Gate Induced Leakage Current in HfO2 MOSFETs due to Remote Interface Trap-Assisted Tunneling", 2006 *International Electron Devices Meeting* (IEDM) technical digest, pp. 755-758, (Dec 2006).

48. L. Condra, J. Qin and J.B. Bernstein, **"**State of the Art Semiconductor Devices in Future Aerospace Systems," *Proceedings of the FAA/NASA/DoD Joint Council on Aging Aircraft Conference,* Palm Springs, CA (April 2007)

49. M. Gurfinkel, J. Suehle, J.B. Bernstein, Yoram Shapira, A.J. Lelis, D. Habersat, N. Goldsman, "Ultra-fast Characterization of Transient Gate Oxide Trapping in SiC MOSFETs", *Proc. of the IEEE International Reliability Physics Symposium* 2007.

50. *J. Qin, X. Li*, J.B. Bernstein, "SRAM Stability Analysis Considering Gate Oxide SBD, NBTI and HCI," 2007 *International Integrated Reliability Workshop* (IIRW) Final Report, 2.2, (October 2007).

51. *M. Gurfinkel,* et. al., "Characterization of Interface and Bulk Oxide Traps in SiC MOSFETs with Epitaxialy grown and implanted channels, 2007 *International Integrated Reliability Workshop* (IIRW) Final Report, 8.3 (October 2007).

52. *L. Yang,* J.B. Bernstein, D. Gajewski and J. Walls, "Predictive Reliability Assessment and Failure Rate Modeling for Electronic Packages," IMAPS 40th International Symposium on Microelectronics, Final Report, WA5 (November 2007).

53. M. Gurfinkel, P. Livshits, A. Rozen, Y. Fefer, J.B. Bernstein, Y. Shapira, "Supply

signal fluctuations due to chip power grid resonance — a new reliability concern", *Proc. of the IEEE International Reliability Physics Symposium,* (April-May 2008)

Magazine Articles:

1. Kump, H.J., Bernstein, J.B., "The Deal fast-surface states are probably deep-level impurities in the semiconductor," *IEEE Circuits and Devices Magazine*, vol. 1, no. 6, pp. 17-22 (1985)
2. Pecht, M., Bernstein, J.B., Searls, D., Peckerar, M., Karulkar, P., "Korea's Focus on Market Dominance," *Semiconductor International*, pp. 118-22 (1998)
3. J.Lee, J. Ehrmann, D. Smart, J. Griffiths, and J.B. Bernstein, "Analyzing the process window for laser copper-link processing", Solid State Technology, (December 2002)
4. J.B. Bernstein, "That we should not know from failures…" (In Hebrew), *Et Lachshov (time to think)*, Vol. 61, pp. 32-33 (Oct. – Dec. 2004)
5. J.B. Bernstein, "Statistical Logic" (In Hebrew), *Et Lachshov*, Vol. 62, pp. 20-22 (Jan. 2005)
6. J.B. Bernstein, "Halacha and Engineering Design" *Et Lachshov*, Vol. 63, pp. 36-37 (Feb. 2005)
7. J.B. Bernstein, "The Moon" (In Hebrew), *Et Lachshov*, Vol. 64, pp. 30-32 (March 2005)
8. J.B. Bernstein, "The Wonders of Silicon" (In Hebrew), *Et Lachshov*, Vol. 66, pp. 28-30 (May 2005)
9. J.B. Bernstein, "Education and Technology" (In Hebew), Et Lachshov, Vol. 67, pp. 22-25 (June 2005)
10. J.B. Bernstein, "Truth through the Scientific Method" (In Hebrew), Et Lachshov, Vol. 74, pp. 25-27 (Feb. 2006)
11. J.B. Bernstein, "Chess and Free Choice" (In Hebrew), Et Lachshov, Vol. 76, pp. 14-17 (May 2006)
12. J.B. Bernstein, "Computers and the Jewish Soul" (In Hebrew), Et Lachshov, Vol. 79, pp. 22-24 (Jul.-Aug. 2006)
13. J.B. Bernstein, "Limitations" (In Hebrew), Et Lachshov, Vol. 80, pp. 22-24 (Sep.-Oct. 2006)
14. J.B. Bernstein, "Good and Bad" (In Hebrew), Et Lachshov, Vol. 82, pp. 16-18 (Dec. 2006)
15. J.B. Bernstein, "Reliable Truth" (In Hebrew), Et Lachshov, Vol. 86, pp. 16-18 (Mar-Apr 2007)
16. J.B. Bernstein, "Scientific Exploration" (Hebrew), Et Lachshov, Vol. 87, pp. 12-15 (May-June 2007)
17. J.B. Bernstein, "The Power of Three" (Hebrew), Et Lachshov, Vol. 89, pp. 32-37 (Jul-Aug 2007)

Additional Publications and Proceedings:

1. Bernstein, J.B., Cohen, S.S., Wyatt, P.W., "Multiple Pulse Effect on Aluminum Thin Films," *Proceedings of Conference on Lasers and Electro-Optics*, 1991
2. Cohen, S.S., Bernstein, J.B., Wyatt, P.W., "Laser-induced line melting and cutting," *50th Annual Device Research Conference*, Massachusetts, June 1992
3. Johnson, M., Bernstein, J.B., "Practical, Reliable, Hermetic Laser Modification of Metallic Interconnect," *Microelectronics Reliability and Qualification Workshop*, NASA, California, June 1998
4. Stark, B., Bernstein, J.B., Lawton, R., Swift, G., " The Effects of Radiation on the Resonant Frequency of a Polysilicon Microstructure," *MEMS Reliability and Qualification Workshop*, NASA, California, August 1998
5. Bernstein, J.B., "Laser Programmable Interconnections Between Metal Lines," *Military and Aerospace Applications of Programmable Devices and Technologies Conference*, NASA, September 1998
6. Zhang, W., Xie, X., Bernstein, J.B., "Laser-Formed Vertical Metalic Link and Potential Implementation in Digital Logic Integration," *Proceedings of MAPLD*, September 1999

7. Goldsman, N. and Bernstein, J.B., "Robust Design of Wide Band-Gap Power Devices," *Proceedings of Advanced Electric Power Systems Conference*, Cookeville, TN, May 2002
8. Bernstein, J.B., "Electronics Parts Life Extension for Military and Avionic Qualification," *Proceedings of Microelectronics Reliability and Qualification Workshop*, Manhattan Beach, CA, December 2002.
9. J. Qin, B. Huang, J. Walter and J.B. Bernstein, M. Talmor, "Reliability Analysis of Avionics in the Commercial Aerospace Industry," The Journal of the Reliability Analysis Center, First Quarter, pp. 1-5 (2005)
10. Bernstein, J.B., Qin, J. "Physics Based Reliability Qualification," 16th International Conference of the Israel Society for Quality, Tel Aviv (November 2006)

Invited Presentations and Seminars:

1. "Electrically Induced Acoustic Wave: General Survey," International Workshop on Non-Destructive Thermal and Acoustic Techniques for Probing Charge and Polarization Profiles in Thin Dielectrics, Freidrichsdorf Germany, May 1993
2. "Laser Induced Microfracture of Inter-Level Dielectric Leading to High Density Vertical Links," International Conference on Processing and Advanced Applications of Lasers, Palm Coast Florida, May 1994
3. "Laser Programmed Connections for Rapid Turn-Around VLSI and MCM Prototypes," MIT Lincoln Laboratory Seminar Series, 1992-1994
4. "Laser Formed Lateral Metallic Connections," 2nd International Conference on Beam Processing of Advanced Materials, Cleveland Ohio, October - November 1995
5. "Reliability Studies Using Focussed Ion Beams," The Essentials of Focussed Ion Beam Technology, UMD Short Course, October 1997
6. Chen, Y., Suehle, J.S., Bernstein, J.B., "A New Technique for Reliability Characterization of Ultra-Thin Gate Oxides," Microelectronics Reliability and Qualification Workshop, NASA, June 1998
7. "Programmable Metallic Connections by Laser Induced Glass Fracture and Metal Flow," 37th Annual Technical Meeting, Society of Engineering Science, SES 2000, Columbia SC, October 2000
8. "Laser Programmable MakeLink Connections," Keynote Speaker, Spring 2002 MEMS Alliance Special Topics Symposium, Columbia MD, April 2002
9. "Failure Analysis Education Objectives," Panel, ISFTA conference, Phoenix AZ, October 2002
10. Bernstein, J.B., "Electronics Parts Life Extension for Military and Avionic Qualification," Aerospace Corp., December 2002
11. Bernstein, J.B. "MARYLAND/ISRAEL CENTER FOR RELIABLE ELECTRONIC SYSTEMS QUALIFICATION," Presentation for ILTAM, Israeli Electronics Users Assoc., August 2003
12. Bernstein, J.B. "Military and Aerospace Qualification of Electronic Systems," Israel Aircraft Industries short course, December 2003
13. Bernstein, J.B. "Electronic System Reliability Qualification," Presentation for ILTAM, Israeli Electronics Users Assoc., April 4, 2005
14. Bernstein, J.B. "Qualification for Chip/IC Reliability," BQR Reliability Seminar, Sheraton Tel-Aviv, June 26, 2007
15. Bernstein, J.B. "Electronic Reliability Qualification," Presentation for ILTAM, July 18, 2007

Patents and Trademarks:

- Laser-Induced Cutting of Metal Interconnect, **#6,057,221**, May 2, 2000
- Technique for Producing Interconnecting Conductive Links, **#5,920,727**, August 17, 1999
- Technique for Producing Interconnecting Conductive Links, **#5,920,789**, July 6, 1999

- Technique for Producing Interconnecting Conductive Links, **#5,861,325**, January 19, 1999
- Structure for Providing One or More Conductive Paths, **#5,585,602**, December 17, 1996
- Interconnecting Conductive Links, **#6,541,868**, April 1, 2003
- MAKELINK, US trademark #2688978, Typed Drawing, **registered** February 18, 2003
- Configurable Analog Block Architecture for Field Programmable Analog Arrays, **Application**

Patent Cases as an expert (last 4 years)

Oblon-Spivak representing GSI Lumonics Corp.: Expert witness for patent interference.

Contracts and Grants

Project Title	Funding Organization	PI or Co-PI	Funding Amount	Year
Methods to Account for Early Wear-out	AVSI consortium	PI	**$286,000**	2007
MIL HDBK 217 Replacement	Wyle Labs	PI	**$86,608**	2007
Advanced Gate Dielectric Reliability	NIST	PI	**$69,965 (1st year)**	2006-2009
JPL NASA Research Program	JPL	PI	**$65,000**	2006-2007
Microelectronic Systems Reliability	AVSI (Aerospace Corporations)	PI	**$180,000 (5th year)**	2006
Ultra Thin Dielectric Metrology	NIST	PI	**$56,000**	2005
Microelectronic Systems Reliability	AVSI (Aerospace Corporations)	PI	**$210,000 (4th year)**	2005
EDCOT Research Consortium	MAGNET (Tel-Aviv Univ.)	Co-PI (50%)	**$100,000**	2004-2005
Laser programmable device design	NSA	PI	**$50,000**	2004-2005
Microelectronic Systems Reliability	AVSI (Aerospace Corporations)	PI	**$157,000 (3rd year)**	2004
Power Device Reliability	ONR	Co-PI (60%)	**$150,000 per year**	2004-2008
Microelectronic Systems Reliability	AVSI (Aerospace Corporations)	PI	**$198,000 (2nd year)**	2003
Laser programmable device design	NSA	PI	**$50,000**	2002-2003
Place and Route for LPAA	Mission Research Corporation	PI	**$198,000**	2002-2003
Laser MAKELINK development	MIPS (Matrics Corporation)	PI	**$77,000**	2001-2002
Alternate Gate Dielectric Analysis	NIST	PI	**$150,000**	2001-2005
Microelectronic Systems Reliability	AVSI (Aerospace Corporations)	PI	**$175,000 (1st year)**	2002
Design and Layout of LPGA: Phase I.	BAE Systems Co.	PI	**$43,070**	2000-2001
Wide band-gap power device reliability	ONR	Co-PI (50%)	**$314,804**	2000 - 2003
Laser Process Development	DOD - NSA	PI	**$75,000**	2000 - 2001
Ultra Thin Dielectric Metrology	NIST	PI	**$234,000**	1999 - 2005
Laser Process Development for CS-22 Process	DOD - NSA	PI	**$146,680**	1999 - 2000

Power Semiconductor metrology	NIST	PI	**$42,300**	1999 - 2000
Alternate Dielectric Metrology	NIST	PI	**$39,231**	1999 - 2000
Laser Process Reliability	NASA / JPL	PI	**$54,080**	1998
Metrology for Power Device Reliability	COMM - NIST	PI	**$6,000**	1998
W Contact evaluation	DOD - NSA	PI	**$5,270**	1998
Power Device Reliability	ONR	PI	**$150,000**	1997 - 2000
Metal Cut Evaluation	General Scanning Corp.	PI	**$25,000**	1997
Gate-Oxide Metrology	NIST	PI	**$124,330**	1996 - 1999
Laser Restructuring / Evaluation	DOD - NSA	PI	**$200,000**	1996 - 1997
Atomic Microscopy and Surface Science	NSA	Co-PI (Participation 25%)	**$122,810**	1994 - 1997

Equipment Donated to University through PI:

Donated Item	Donating Agency	Value of Donation
Laser Semiconductor Process Equipment	XRL Corporation	$300,000
Laser Semiconductor Process Equipment	Electro Scientific Industries	$700,000
Electromigration Test Equipment	Aetrium Corporation	$150,000
Plasma-Etchers	NSA	$500,000

UMCP Foundation Donations $85,000.00

Awards:

- Fulbright Senior Researcher/Lecturer, 2004-2005
- IEEE Senior Member, 2003
- NASA / ASEE Summer Faculty Research Fellow at JPL, 1998

TEACHING AND ADVISING

Courses Taught in Last 5 Years:

- ENME 392 – Statistics for Engineers (Undergraduate)
- VLSI Design – Tel-Aviv University/Bar-Ilan University (Advanced Undergraduate)
- ENME 320 – Thermodynamics (Advanced Undergraduate elective).
- ENES 100 - Introduction to Engineering Design (Undergraduate, General)
- ENRE 661- Microelectronics Device Reliability (Advanced Graduate)
- ENRE 653 - Advanced Reliability Engineering (Core Graduate)
- ENRE 799 - Reliability Masters Research Supervision
- ENMA 849 - Materials Doctoral Research Supervision
- ENMA / ENRE 899 - Reliability Doctoral Research Supervision

Courses or Curriculum Developed:

- ENRE 600 Introduction to the physics of failure and statistical tools needed to understand fundamental physical processes that lead to failures. This course develops the basic mathematical underpinnings of lifetime acceleration models and approaches to analyzing data.

- ENRE 661 Semiconductor device physics of failure, designed for graduate students with some background in semiconductor device operation in addition to having had core courses in reliability. This course incorporates the latest understanding of specific wear-out mechanisms.

- ENRE 653 Specific failure modes present in mechanical and electronic systems are analyzed and brought to light in this course through real-world examples.

Manuals, Notes, Software, and Other Contributions to Teaching:

- Bernstein, J.B., "Fundamentals of Failure," A 33-page teaching manual for ENRE 653
- Departmental Brochure, "Microelectronics Reliability Engineering."
- "Reliability Physics and Statistics," course at Jet Propulsion Laboratory 1998

Graduate Advising:

Completed PhD's:

1. Prasad Chaparala, ENRE (co-advisor), Thesis entitled "Field and Temperature Acceleration of Time-Dependent Dielectric Breakdown in Intrinsic Thin Silicon Dioxide Films Under Static and Dynamic Stress," 1996, National Semiconductor Corp.
2. Yuan Chen, ENRE Thesis entitled "Reliability Characterizations of Ultra-Thin Gate Oxides for MOSFETs," 1998, Lucent Corp.
3. Chih-Chieh Shen, ENMA Thesis entitled "A Comprehensive Study of IGBT Turn-off Failure for Unclamped Inductive Loading Conditions," 1999, Conexant Corp.
4. Wei Zhang, ENRE Thesis entitled "Laser-Induced Vertical Metallic Link and Implementations in VLSI," 2000, Post-Doc at University of Maryland
5. Joo-Han Lee, ENCH (Chem Eng) Thesis entitled "Analysis of Laser Processing of Metal Wires used in Microelectronics Applications," 2001, GSI Lumonics Corp.
6. Bin Wang, ENRE Thesis entitled "Reliability Characterizations and Failure Mechanism of Ultra-Thin Oxides for MOS Devices," 2001, Silicon Valley Start-up Company.
7. Maj. Jörg Walter, ENRE Thesis entitled “Methods to Account for Accelerated Semiconductor Device Wearout in Long Life Aerospace Applications,” 2003, Professor at Air Force Graduate Institute, Daton Ohio
8. Baozhong Zhu, Thesis entitled “Experimental study of bias temperature instability and progressive breakdown of advanced gate dielectrics,” May 2005, Qualcom
9. Da-Wei Heh, ENEE, Thesis entitled “Characterization of Electrically Active Defects in Advanced Gate Dielectrics,” August 2005, Senior Research Staff, SEMATECH, Austin TX.
10. Ji Luo, Thesis entitled “Circuit Design and Routing for Field Programmable Analog Arrays,” November 2005, Senior Research Staff, LSI Logic Corp.
11. Xiaojun Li, Thesis entitled “Deep Submicron CMOS VLSI Circuit Reliability Modeling, Simulation and Design,” November 2005, Intel Corp.

12. Kuan-Jung Chung, Thesis entitled "Microbridge Formation for Low Resistance Interline Connection using Pulsed Laser Techniques," December 2005, Assistant professor, National Taiwan Normal University (Graduate Institute of Science Education) Taiwan
13. Xiaohu Zhang, "Failure Mechanism Investigation for Silicon Carbide Power Devices," April 2006
14. Bing Huang, "Study of the Impact of Hardware Failures on Software Reliability," May 2006, Senior Research Staff, Freescale Corp.

SERVICE

Professional & Community:

- Technical Program Committee, IRPS, 1995-1997, 2005-2007 (Product and Oxide sessions)
- Technical Program Chair, IRPS, 1995-1996
- Technical Program Committee, SPIE, 1995-1996
- Conference Sessions Chair, SPIE, 1996
- Judge, Howard County Science Fair, 1996
- Reviewer, Materials Research Society Bulletin, 1997
- Reviewer, IEEE Transactions Electron Devices1997-2005
- International Integrated Reliability Workshop, 1997-2005
- NASA proposal review committee for NPPP at JPL, 1999 – 2007
- Reviewer for Microelectronics Engineering, 2006-2007
- Reviewer for IEEE Transactions on Device and Materials Reliability, 2006-2007

University:

- Letters and Sciences advise-5 program, 1996 - 2001
- College of Engineering Council, 1996-1997, 2000
- Faculty Merit Pay Review Committee, 1997 - 1999
- Reliability Engineering Student Selection Chair, 1998 - 2000
- C. Raymond Knight Fellowship Award Chair and Banquet Organizer, 1999 - 2001
- Reliability Faculty Search Committee, 1999 and 2000
- Microelectronics reliability curriculum chair, 1996 - 2002
- Secretary of the Engineering Council, 2002-2003
- Tenure and Promotion Policy review committee, 2001-2002
- Engineering Department Plan of Organization Review Committee, 2002-2003

INDUSTRIAL CONSULTATION AND INVOLVEMENT

- Veraz Telecommunication; System Reliability Consultant
- Israel Aircraft Industries; Lecturer and Consultant
- LaserLink Technology; Founder and Chief Scientist (Maryland)
- Lightspeed Semiconductor; Founder, Chief Scientist, and Consultant (California)
- Honeywell Corporation; laser processing consultation
- Cypress Semiconductor; laser processing consultation and trial expert witness
- Teradyne Corporation; Device and system reliability consultant
- Mission Research Corporation; Design and consulting on laser programmable elements
- Matrics Technology, LLC; Business and Laser process consulting
- Xilinx Corporation; Design and Consulting on laser programmable circuit elements
- Analog Devices; Device reliability consultant
- Chip Express Corporation; Design and consultation
- Prototype Solutions; Laser processing consultation

- SiReverse; Consultant on silicon reverse engineering technologies
- GSI Lumonics; Improving laser cut and link technologies and expert witness
- XRL Inc.; Consultant to help develop processes
- Electro-Scientific Industries; Improving laser cut and link technologies
- Telrad, Teledata, IAI; Reliability consulting and teaching