

## **Experience**

- Experienced in Trial & Deposition Testimony, Expert Reports, etc.
- Highly published and widely quoted as a key semiconductor industry analyst.
- 37-year semiconductor industry veteran.
- Honorary Member: Storage Networking Industry Association (SNIA)
- Deep technical understanding and design background.
- Highly analytical.
- Excellent communications skills: oral, written, and presentation.
- Author of key reference design work: "The Cache Memory Book" Harcourt Brace, 1993
- Patent holder in cache memory design

## **Expert Experience**

### **Trial Testimony**

In Re: Spansion et al Federal Bankruptcy Court of Delaware Docket No: 09-10690, (Hon. Kenneth Carey). 11/30/09

Netlist, Inc. (Plaintiff) vs. Diablo Technologies, Inc. (Defendant), US District Court, Northern District of CA, Case No. 13-CV-05962 YGR, (Hon. Yvonne Gonzalez Rogers), 3/13/15

### **Deposition Testimony**

In Re: Spansion et al Federal Bankruptcy Court of Delaware Docket No: 09-10690, (Hon. Kenneth Carey). 11/24/09

In Re: SRAM, 07-CV-1819-CW (N.D. Cal.), 3/25/10

### **Expert Reports**

**Expert Rebuttal Report** - In Re: Spansion et al Federal Bankruptcy Court of Delaware Docket No: 09-10690, (Hon. Kenneth Carey). 11/20/09 (8 pages)

**Expert Report** - In Re: SRAM, 07-CV-1819-CW (N.D. Cal.), 1/25/10 (13 pages)

**Expert Report** - In Re: Qimonda Richmond, LLC, et al., Case No. 09-10589 (MFW) 2/6/12 (30 pages)

**Expert Report** - Netlist, Inc. (Plaintiff) vs. Diablo Technologies, Inc. (Defendant), US District Court, Northern District of CA, Case No. 13-CV-05962 YGR, (Hon. Yvonne Gonzalez Rogers), 1/16/15 (30 pages)

### **Other Data**

Assisted in a search for prior art in two confidential patent actions

Discussed industry norms in semiconductor pricing with an attorney in a confidential collusion action.

Estimated past and projected factory shipments for ongoing royalty negotiations.

## **Job History**

### **Present**

#### **President, Objective Analysis, Semiconductor Market Research**

Founded successful consulting and market analysis firm well reputed in this business.

Leading analyst for semiconductor memory marketplace (DRAM, SRAM, NAND and NOR flash, flash cards, EPROM, EEPROM, mask ROM and other technologies.)  
Consultant to industry leaders and publisher of subscription market research.  
Frequent presenter at industry events and client visits.

## **2002 – 2006**

### **Director of Nonvolatile Memory Research, Semico Research Corp.**

Developed key analysis of memory markets.  
Orchestrated other analysts' research efforts in both chips and application markets.

## **2000 – 2002**

### **Senior Director of Corporate Marketing, Silicon Storage Technology, Inc.**

Led team that defined and implemented marketing programs to sell SST's flash memories.  
Responsible for annual sales of \$270 million. Grew market share during market downturn.

## **1991 – 2000**

### **Director and Chief Analyst, Dataquest.**

Responsible for all memory forecasts, models, and analysis. Managed worldwide team.  
Extensive written work, published in periodicals and Dataquest documents for customers.

## **1986-1991**

### **Strategic Marketing Manager, Integrated Device Technology.**

Defined and architected introduction of company's fastest-ever ramping products.

## **Earlier Employment**

Intel Corporation – Software Product Marketing  
National Semiconductor – Microprocessor Product Marketing and System Design  
SCI Systems, Inc. - Minicomputer-Based System Design

## ***Education***

Bachelor of Electrical Engineering, Georgia Tech, 1974  
Master's in Business Administration, University of Phoenix, 1982

## **Publications:**

### ***Objective Analysis Reports<sup>1</sup>***

The Enterprise SSD: Technologies & Markets (April 2014)  
How Many IOPS Do You Really Need? (July 2014)  
The Enterprise SSD: Technologies & Markets (April 2014)  
How PC NAND Will Undermine DRAM (July 2011)  
Are Hybrid Drives Finally Coming of Age? (October 2010)  
Putting SSDs to the Test (October 2010)  
Solid State Disk Market Outlook 2010 (August 2010)  
Intel's Braidwood: Death to SSDs? (August 2009)  
Digital Storage in Consumer Electronics 2009 (January 2009)  
Solid State Drives in the Enterprise (August 2008)  
Digital Storage in Consumer Electronics 2008 (January 2008)

---

<sup>1</sup> This list of publications includes those from the past ten years that I can recall or have been able to identify based on a diligent search.

Flash Packaging: What Phone Makers Want and Why (January 2008)  
Hybrid Drives: How, Why, and When (December 2007)  
Understanding the NAND Market (November 2007)  
The Solid-State Disk Market: a Rigorous Look (September 2007)

### ***Objective Analysis Briefs***

Why DRAM Vendors Must Consolidate  
2008: Tough Year Ahead

### ***Objective Analysis Alerts***

Cypress and Spansion to Merge (1 December, 2014)  
Samsung Acquires Proximal Data (3 November, 2014)  
Samsung Samples 3D NAND SSD (1 July, 2014)  
SanDisk to Acquire Fusion-io (16 June, 2014)  
Avago to Acquire LSI Corporation (19 December, 2013)  
Rambus and Micron Sign License Agreement (12 December, 2013)  
OCZ to File for Bankruptcy (27 November, 2013)  
Cisco to Acquire Whiptail (10 September, 2013)  
Western Digital Acquires Virident (9 September, 2013)  
Fire at SK hynix Wuxi Plant (4 September, 2013)  
SanDisk to Acquire SMART Storage (2 July, 2013)  
Western Digital to Acquire sTec (24 June, 2013)  
Fusion-io Founders Resign (9 May, 2013)  
Seagate Jumps Into PCIe SSD Market (29 January, 2013)  
Significant Earthquake off Japan Coast (14 December, 2012)  
New Report Analyzes IOPS Needs for Enterprise Applications (27 November, 2012)  
Intel's Otellini to Step Down in May (19 November, 2012)  
IBM Announces Intention to Acquire Texas Memory Systems (16 August, 2012)  
Micron to Acquire Elpida, Majority of Rexchip (2 July, 2012)  
SK Hynix Acquires Link\_A\_Media (20 June, 2012)  
Intel Sells IMFT Assets to Micron (28 February, 2012)  
Elpida Files for Bankruptcy (27 February, 2012)  
Micron's Appleton Killed in Plane Wreck (3 February, 2012)  
Micron and Hynix Prevail in Rambus Suit (16 November, 2011)  
LSI Acquires SandForce (27 October, 2011)  
SanDisk Acquires Pliant Technology (17 May, 2011)  
Italy Proposes PV FIT Reductions (21 April, 2011)  
Seagate and Samsung "Combine" HDD Businesses (19 April, 2011)  
Texas Instruments to Acquire National Semiconductor (6 April, 2011)  
Japan Earthquake Update (23 March, 2011)  
Major Earthquake Hits Japan (11 March, 2011)  
Western Digital to Acquire Hitachi Global Storage Tech for \$4.3 Billion (7 March, 2011)  
Powerchip to Become PC DRAM Foundry for Elpida (31 December, 2010)  
Toshiba NAND Fab Suffers Power Outage (8 December, 2010)  
Micron to Acquire Numonyx (10 February, 2010)  
Microchip to Acquire SST (3 February, 2010)  
Intel and Micron Introduce 25nm NAND (1 February, 2010)  
Samsung and Rambus Settle Patent Litigation (21 January, 2010)  
Micron & Intel's 32nm 3-bit NAND Arrives (11 August, 2009)

Spansion Settles with Samsung (8 April, 2009)  
Italy Earthquake Threatens Micron Fab (8 April, 2009)  
Spansion Files for Chapter 11 Protection (2 March, 2009)  
Spansion President Resigns (3 February, 2009)  
Qimonda Petitions for Insolvency Proceedings (23 January, 2009)  
Intel & Hitachi Co-Develop Enterprise SSDs (2 December, 2008)  
Spansion Sues Samsung (17 November, 2008)  
Samsung Withdraws SanDisk Bid (21 October, 2008)  
Toshiba to Acquire 30% of SanDisk's Share of JV Production (20 October, 2008)  
Micron to Buy Out Qimonda's Share of Inotera (13 October, 2008)  
Samsung Goes Public with SanDisk Offer (19 September, 2008)  
Intel & Micron Skip 40nm Process - Jump to 34nm (29 May, 2008)  
Hynix China Fab Suffers Power Outage (20 May, 2008)  
Seagate Fires First Volley at SSD Maker STEC (14 April, 2008)  
Numonyx Makes its Debut (31 March, 2008)  
Micron/Nanya MOU - Qimonda's Bane or Boon? (4 March, 2008)  
Power Outage in Korea: Six Samsung Fabs Closed (3 August, 2007)  
Earthquake in Japan - Little Fab Impact Expected (17 July, 2007)  
Intel & ST Create New Flash Company (22 May, 2007)  
Apple Story Portends NAND & DRAM Shortage (27 April, 2007)  
Earthquake in Japan - No Fabs Reporting Losses (24 March, 2007)  
Hynix & SanDisk Cross-License NAND & Form JV (21 March, 2007)

### ***Objective Analysis & SNIA White Papers***

Survey: Users Share Their Storage Performance Needs (December 2014)  
Matching Flash to the Processor (March 2014)  
Using Flash as Memory - A More Straightforward Way to Boost Performance (July 2013)  
Making the Most of Flash Storage (June 2012)  
Enterprise Reliability, Solid State Speed (February 2012)  
NoC Interconnect Improves SoC Economics (April 2011)  
Two May be Better Than One: Why Hard Disk Drives and Flash Belong Together (February 2011)  
Choosing the Right Solid State Storage Device: A Case Study of the SNIA SSSI Performance Test Specification (November 2010)  
NVELO's Dataplex, NAND Cache is Back! (June 2010)  
Flash and HDD: Symbiosis or Survival of the Fittest? (Sept 2009)  
Phase-Change Memory Becomes a Reality (August 2009)  
NAND Flash Storage for the Enterprise - an In-Depth Look at Reliability (April 2009)  
Solid State Storage 101 (January 2009)  
Why we Need a New Memory Technology (January 2008)

### ***Semico Reports (2002-2006)***

Quarterly forecasts for the nonvolatile memory markets  
Annual market share rankings for the nonvolatile memory market  
Annual reports analyzing and forecasting the markets for USB flash drives and flash cards.

### **Special Analyst Reports**

Occasional reports analyzing and forecasting the markets for flash in cell phone handsets and flash in hard disk drives, and the solid state drive market.

## **Semico Newsletter Articles**

Weekly analyst “Spins” May 2002 – November 2006

## ***Periodical Articles***

Forecast for Semiconductors and Things in 2014

Electronic Design, 12/18/13

32-Bit Microcontrollers Hit New Lows

Microprocessor Report, 1/7/13

Ancient Aliens Fail: Electronics Industry Looks to 2013

Electronic Design, 12/17/12

Who wants Elpida and why? Analysts weigh in

EE Times, 4/11/12

ISSCC from a memory analyst’s view

ElectroIQ, 3/2/12

Memory Considerations for Faster MCUs

DigiKey, 1/18/12

Clouds Loom On The 2012 Semiconductor Horizon

Electronic Design, 12/27/11

DRAM And NAND Prices Will Collapse Later In 2011

Electronic Design, 12/14/10

Multicore processors: Now a movement

EE Times, 9/27/10

Solid State Drives for Energy Savings

SNIA Europe Newsletter, 5/10/10

Solid State Drives for Energy Savings

SNIA Europe: Storage Networking Times, 4/15/10

Phase Change Memory will Change Memory System Design

RTC Magazine, 3/22/10

Does MLC flash belong in enterprise SSDs?

InfoStor, February 2010

Flash vs. hard drives: The battle intensifies

Solid State Technology, 9/1/06

SanDisk Vaulted Disk and Spansion’s Server Flash Portend Long Term DRAM Trouble

Pund-IT Weekly Review 11/28/07

WSTS Reports October Chip Sales Up 5%  
Pund-IT Weekly Review 12/5/07

EMC: Why Flash? Why Now?  
Pund-IT Weekly Review 12/5/07

Solid State Drives in Notebooks – Still Hard to Justify, but Advantages are Improving  
Pund-IT Weekly Review 2/20/08

BiTMICRO's New 1TB+ E-Disk Altima Ultra320  
Pund-IT Weekly Review 3/5/08

Managing Size, Heat, and Noise  
Pund-IT Weekly Review 3/26/08

Seagate Fires First Volley at STEC  
Pund-IT Weekly Review 4/23/08

Intel & Micron Skip 40NM NAND Process – Jump to 34nm  
Pund-IT Weekly Review 6/4/08

Sun Introduces Fast, Green SSD Product Line  
Pund-IT Weekly Review 6/11/08

A Rugged Test for Drives  
Pund-IT Weekly Review 5/28/08

Fusion-io — Turbocharging I/O Performance  
Pund-IT Weekly Review 6/18/08

SSDs Key at Simultaneous Conferences  
Pund-IT Weekly Review 7/30/08

SSDs: A Tale of (Another) Two Conferences  
Pund-IT Weekly Review 10/1/08

Samsung Goes Public with SanDisk Offer  
Pund-IT Weekly Review 9/17/08

Enterprise SSDs All the Rage at Multiple Conferences  
Pund-IT Weekly Review 9/24/08

Micron to Buy Out Qimonda's Share of Inotera  
Pund-IT Weekly Review 10/15/08

You Can't Hide From Solid State Drives, Even at SNW  
Pund-IT Weekly Review 10/22/08

Spansion Sues Samsung  
Pund-IT Weekly Review 11/19/08

Violin Memory: Getting Ready to Play Some Beautiful Flash Memory Music  
Pund-IT Weekly Review 11/12/09

Intel and Hitachi to Co-Develop Enterprise Flash SSDs  
Pund-IT Weekly Review 12/3/08

Flashing Forward – IBM Updates Project Quicksilver  
Pund-IT Weekly Review 12/23/09

Managing Wear in SSDs  
Pund-IT Weekly Review 1/14/09

Spanion Files for Chapter 11 Protection  
Pund-IT Weekly Review 3/4/09

The Web Turns 20  
Pund-IT Weekly Review 3/25/09

What a Week for SSD Announcements!  
Pund-IT Weekly Review 3/18/09

Schooner Pursues a Unique Path in the Data Center  
Pund-IT Weekly Review 4/15/09

Virident Introduces MySQL and memcached Accelerators  
Pund-IT Weekly Review 4/29/09

STEC SSDs Introduced in Multiple IBM Systems  
Pund-IT Weekly Review 5/6/09

Fusion-io Makes SSDs More Affordable  
Pund-IT Weekly Review 7/15/09

Micron and Intel's 34nm 3-bit NAND Arrives  
Pund-IT Weekly Review 8/12/09

WhipTail's New SSD Storage Appliance  
Pund-IT Weekly Review 8/5/09

Sun's F5100 – A New Direction in Storage Architecture  
Pund-IT Weekly Review 10/14/09

The Need for Speed: Sorting Out SSD Strengths & Weaknesses  
SNIA Europe: Storage Networking Times, 10/13/09

Fusion-io Makes SSDs More Affordable  
Byte and Switch, 7/27/09

Organic Photovoltaics Offer Promise for Future Development

CircuiTree, 7/1/09

Cell Efficiency is Key to Success of Photovoltaics  
Circuits Assembly, 6/4/09

The Need for Speed: Sorting out SSD strengths and weaknesses  
InfoStor, 5/19/09

Who uses SSDs, and why?  
InfoStor, 2/18/09

Intel and Hitachi to Co-Develop Enterprise Flash SSDs  
ITworld.com, 12/11/08

SSDs poised for the enterprise  
InfoStor, 11/6/08

Holiday spending outlook's a mixed bag  
Solid State Technology, 10/31/08

## **Blog Posts**

### ***Forbes Chip Talk Blog***

7/31/14	Why I Attend the Flash Memory Summit
7/21/14	When Soccer Trumps Solar
7/8/14	SIA: May Semiconductor Revenues Reached \$26.9 Billion
7/8/14	Will Samsung's V-NAND SSD Change The Flash Game?
6/16/14	SanDisk to Acquire Fusion-io
6/10/14	Samsung Announces 2nd-Generation 3D NAND
6/9/14	SIA: April Chip Sales \$26.3 Billion
5/30/14	Can A DRAM Oligopoly Really Work?
5/28/14	The 3 Reasons Semiconductors Experience Revenue Cycles
5/26/14	How many transistors have ever shipped?
5/22/14	How Hard Can It Be To Make 3D NAND Flash Chips?
5/5/14	Semiconductors Post Biggest Q1 in History
4/30/14	Why Are Computer Chips So Expensive?
4/30/14	The Semiconductor Cycle Is Dead...Again!
4/30/14	The Biggest Problem Facing Semiconductors
4/22/14	Growth Market: Enterprise SSDs
4/4/14	February Semiconductors Hit Record High
3/31/14	Micron, Italy, & Strikes
3/29/14	Did Intel's SSDs Undermine Its Processor Sales?
3/28/14	Is Microsoft Mismanaging XP?
3/27/14	How Memory Growth Can Predict Semiconductor Growth
3/3/14	January Semiconductors Break Sales Record
2/28/14	SanDisk Card Reflects Incredible Growth
2/21/14	Is Samsung Losing at Economies of Scale?
2/11/14	Semiconductors – A Crazy Industry
2/10/14	Rambus Founder Opines on Semiconductor Industry's Future

2/3/14 SIA: Semiconductors Finally Break \$300 Billion Barrier  
1/31/14 NPR @ CES  
1/30/14 Geek Antiques  
1/30/14 Replacing Mechanisms with Microchips  
1/15/14 SIA: Record World Semiconductor Revenues in November  
1/15/14 SEMI: Forecasts are Positive at Annual ISS Conference  
12/31/13 7 Reasons Semiconductor Stocks Will Shine in 2014  
12/31/13 Is it Time to Put Chips in Guns?  
12/16/13 Avago to Acquire LSI: Strong Synergies Plus Diversification  
12/12/13 Rambus vs. Micron: Who Really Won?  
12/5/13 October Semiconductor Sales Surge 7% - On Track to Break \$300 Billion  
Bogey  
11/30/13 Can a Belgian Company Save Semiconductors?  
11/26/13 Maxim: Wear This Shirt or Die Young  
11/18/13 Is Micron Gunning for Intel's Processor Business?  
11/11/13 3 Guidelines for Success From An Award-Winning Executive  
11/5/13 SIA: Record-Breaking Semiconductor Sales  
10/23/13 How Healthcare will Drive Semiconductors  
10/4/13 SIA; Greatest Semiconductor Growth Since March 2011  
9/27/13 SIA: Helium Reserve Open For Business  
9/6/13 Why the SK hynix Fire Matters  
9/4/13 SIA: July up 5.1% from a year ago  
8/30/13 Chips and the Tragedy of the Commons  
8//13 Intel's History and Outlook: Otellini's Viewpoint  
8/10/13 Avoid Cross-Cultural Traps  
8/6/13 One Way to Beat Robocallers  
8/5/13 SIA: First Half Semiconductors Look Good  
7/29/13 Silicon Valley Envy  
7/15/13 imec: Semiconductor Solutions are a Team Effort  
7/12/13 Applied Materials: Business is Coming Our Way  
7/2/13 SanDisk Announces Construction Right on Time  
7/1/13 SIA Reports Global Semi Sales Jump  
6/26/13 Father of Immersion Litho Receives Award  
6/19/13 Video on the Birth of Silicon Valley  
6/12/13 Rambus and SK Hynix Settle  
6/7/13 WSTS Releases Cautious Spring Semiconductor Forecast  
6/6/13 SIA: April Semiconductor Revenues Slightly Up  
5/25/13 Book: The Valley of Heart's Delight  
5/17/13 Some Insight into CEO Departures  
5/14/13 Did Toshiba Really Cut NAND Flash Production?  
5/13/13 Fusion-io Loses Founders  
5/10/13 March Semiconductor Sales Up Again  
4/22/13 The Cold War is Really Over!  
4/16/13 Semiconductors Start to Turn Around  
4/2/13 SIA: February Shows Mild Growth  
4/2/13 FTC Awards "Robocall Challenge" Winners  
4/1/13 Arrest Worries Valley Execs  
3/31/13 When Silicon Won't Do  
3/25/13 Moore's Law vs. Wright's Law  
3/22/13 Is the Semiconductor Cycle Dead?

3/21/13 What Makes Samsung Tick?  
3/6/13 Semiconductors Positive in January  
2/28/13 Why do Semiconductors Constantly Shrink?  
2/27/13 Does the "Do Not Call" List Even Work?  
2/19/13 Looking into the Far Future of Chips  
2/5/13 How the Yen's Slide Helps Renesas  
2/4/13 SIA: 2012 Semiconductor Revenues Just Miss \$300 Billion  
1/18/13 Will Crowdfunding Change the Face of Consumer Electronics?  
1/17/13 CES: No Kodak, No SanDisk  
1/16/13 SEMI: Semiconductor Industry to Massively Transform  
1/13/13 New Cars: Semiconductors and an Engine  
12/31/12 2013: A Turning Point for Semiconductors  
12/28/12 A Review of Semiconductor Forecasts  
12/14/12 IEDM and the Future of Semiconductors  
12/7/12 Japan – Big Earthquake In Semiconductor Country  
12/6/12 SIA: October Up, Above Seasonal Rate  
11/29/12 WSTS Reduces 2012 Semiconductor Forecast  
11/28/12 The Role of Demand in Semiconductor Forecasts  
11/19/12 Intel's Otellini to Step Down in May  
11/6/12 SIA: Semiconductors Sequentially Up, Annually Down  
11/1/12 Court OKs Micron/Elpida Deal  
10/31/12 Semiconductor Earnings Season: Mixed Messages  
10/10/12 OCZ Shares Good News and Bad News  
10/5/12 Maxim: Growth in a Shrinking Market  
10/2/12 Semiconductor Basics: Two Excellent Videos  
10/2/12 SIA: Semiconductor Sales Flat in August  
9/30/12 Why are Semiconductor Companies Suffering?  
9/28/12 Where did Silicon Valley's Fabs Go?  
9/21/12 Intel Developer Forum Recap  
9//12 Tech CEOs Move On  
9/5/12 SIA: July Semiconductor Revenues Slightly Up  
8/27/12 Why's Everyone Investing in ASML?  
8//12 Why Does Intel Make NAND Flash?  
8/16/12 Think Yelp is Unbiased? Think Again!!  
8/13/12 Testing the DRAM Profit Myth  
8/5/12 SIA: Semiconductor Sales Flat, Rather than Down  
7/31/12 SSD Growth is Demand, not Supply, Limited as CEOs Claim  
7/30/12 Exchange Rates Rattle Semiconductor Makers  
7/24/12 Toshiba Cuts NAND Production 30%: Will it Help?  
7/6/12 SIA: Everything's Still Rosy  
7/3/12 Micron Unveils Elpida Acquisition  
6/30/12 Evangelist Marketing: Some Lessons for All of Us  
6/28/12 Learning Leadership from a New Perspective  
6/21/12 SK Hynix Acquires Link\_A\_Media  
6/7/12 Why Use Silicon?  
6/6/12 SIA April Semiconductor Sales: Down Y/Y but Up M/M  
5/30/12 What is it Like to Live in Silicon Valley?  
5/22/12 Semiconductors and the Mafia  
5/18/12 Storage Valley or Silicon Valley?  
5/15/12 IMFT - Intel's Billion Dollar Sandbox

5/1/12 SIA: Sequential Growth, But YoY Collapse  
4//12 Semiconductor CapEx Continues to Grow  
4/19/12 DRAM Consolidation and the McKinsey Steel Model  
4/11/12 SanDisk Demurs, Market Loses \$106 Billion  
4/7/12 SSD Start-Up Valued at \$800 Million  
4/3/12 Feb WSTS, Down Again!  
3/31/12 Geeks and April Fool's Day  
3/17/12 Why Semiconductors are Like Airlines & Shipping  
3/11/12 Elpida's Bankrupt: Who's Next?  
3/5/12 SIA Announces January Semiconductor Sales, Down 8.8%  
3/5/12 Why Did AMD and Intel Withdraw from WSTS?  
2/28/12 Intel Sells Flash Assets  
2/27/12 Elpida Files for Bankruptcy  
2/14/12 Elpida Confronts Potential Bankruptcy  
2/13/12 A \$300 Billion Semiconductor Market? Not Yet!  
2/12/12 How Thai Floods will Soften Semiconductor Prices  
2/3/12 Appleton Death  
1/19/12 2012 Semiconductor Forecasts – Take Your Pick  
1/3/12 SIA: November Was Best Semiconductor Month of 2012  
12/29/11 What Causes Semiconductor Cycles?  
12/28/11 What it's like in a semiconductor fab  
12/14/11 What is a Nanometer?  
12/7/11 SIA: Optimism Amid a Downturn  
11//11 How Does Process Relate to Cost?  
11/13/11 The End of Semiconductor Scaling  
11/6/11 What Does "Solid State": Mean?  
11/1/11 Semiconductor Sales Up in September - Or Maybe Not!  
10/31/11 Why Read a Semiconductor Blog?

### ***The SSD Guy Blog***

10/25/14 What's In My SSD? SLC, MLC, or TLC?  
10/9/14 Comparing Samsung's Planar and V-NAND SSDs  
10/6/14 SanDisk: We'll Upgrade Your PCs For You!  
9/30/14 Why Aren't SSDs Popular in New PCs?  
9/24/14 Video: A Brief History of SSDs  
9/23/14 Big New HDDs Indefinitely Postpone SSD/HDD Price  
9/19/14 How Big Can an SSD Get?  
9/17/14 Hybrid Drives Not Catching On  
8/22/14 SanDisk's 3-Bit SSD, the Ultra II  
7/16/14 New Report Posts Results of IT Manager IOPS Survey  
5/5/14 Making Data Destruction ABSOLUTE!  
4/22/14 New Study Forecasts Huge Enterprise SSD Growth  
4/16/14 White Paper: Matching Flash to the Processor  
1//14 IBM Launches Flash DIMMs  
12/2/13 OCZ: Bankruptcy Certain, Outcome in Question  
11/18/13 LSI SandForce SSD Controllers Move the Knee in the Curve  
10/17/13 Kaminario Seizes SPC1 Title Again  
10/15/13 Violin & Microsoft Take a New Approach to Scaling  
8/28/13 Solving SSD Power Spike Issues

8/20/13 IBM Adds Server-Side Caching  
8/16/13 A New Way to Use SSDs  
8/13/13 Skyera Launches 500TB 1U Flash Box  
8/12/13 Nimbus Launches 4th Generation Flash Appliance  
8/12/13 Violin Ups Capacity, Performance, and Economics  
8/9/13 White Paper: Using Flash as Memory  
7/30/13 Diablo: Flash Belongs on the Bus  
7/23/13 OCZ Launches Database Accelerator  
7/19/13 Webinar: Flash Best Practices  
7/3/13 SanDisk to Acquire SMART Storage  
6/26/13 Kaminario's Performance and 7-Year Flash Life Warranties  
6/24/13 Western Digital to Acquire sTec  
6/19/13 IBM Makes Flash Even Faster  
6/19/13 SanDisk Upgrades FlashSoft Cache  
6/7/13 Webinar: Replacing DRAM with SSDs  
5/30/13 SPDEcon Sneak Peek  
5/30/13 Viking: Why Wait for Nonvolatile DRAM?  
5/17/13 Seagate's Big Intro: Four New SSD Families in One Day  
5/15/13 Webinar: How Many IOPS Do You Really Need?  
5/13/13 CEO Change at Fusion-io  
4/23/13 Kaminario Goes All-Flash  
4/16/13 IBM to Invest \$1B in Flash Promotion  
4/10/13 WDC's HGST Intros 12G SAS MLC SSDs  
3/30/13 Seagate Upgrades Hybrids, Phases Out 7,200RPM HDDs  
3/29/13 One-Hop vs Two-Hop PCIe SSDs  
3/29/13 Are HDDs Vibration Sensitive?  
3/28/13 Understanding Storage Delays  
3/26/13 LSI's Take on Data Center Flash  
3/26/13 Nimbus Upgrades both Software and Hardware  
3/4/13 Violin Bets on Both Sides  
3/1/13 "Noisy Neighbor" or Cuckoo?  
2/26/13 Extreme SSD Error Correction  
2/7/13 New Booklet: How Controllers Maximize SSD Life  
2/1/13 SSDs and TCO  
1/30/13 Seagate Virident  
1/16/13 How Software can Hamper SSD Performance  
12/7/12 Is Silicon Cheaper Than Iron?  
12/3/12 SSDs that Don't Wear Out  
12/3/12 How Many IOPS Do You Really Need?  
11/19/12 Enterprise SSDs to Grow Over 10x by 2016  
11/14/12 Why Don't HDDs Spin Faster than 15K RPM?  
11/9/12 How Controllers Maximize SSD Life – Internal NAND Management  
11/5/12 Intel Intros Fast Datacenter SATA SSD  
11/2/12 How Controllers Maximize SSD Life – Feedback on Block Wear  
11/2/12 Happy Birthday to The Memory Guy!  
10/30/12 19nm & 20nm SSDs Arrive!  
10/26/12 How Controllers Maximize SSD Life – Over Provisioning  
10/25/12 Apple's Fusion Drive - An SSD Cache for the Macintosh  
10/19/12 How Controllers Maximize SSD Life - Reduced Write Amplification  
10/12/12 How Controllers Maximize SSD Life - Other Error Management

10/10/12 OCZ Drafts New CEO  
10/5/12 How Controllers Maximize SSD Life - Improved ECC  
10/2/12 IBM Completes Texas Memory Systems Acquisition  
9/28/12 How Controllers Maximize SSD Life – External Data Buffering  
9/27/12 Toshiba Announces its Hybrid Drive  
9/27/12 Samsung Introduces TLC SSD  
9/24/12 Storage Developer Conference Focuses on SSDs  
9/21/12 How Controllers Maximize SSD Life – Better Wear Leveling  
9/19/12 The Week of CEO Changes  
9/14/12 How Controllers Maximize SSD Life  
9/12/12 Seagate Updates Hybrid Drive  
9/11/12 WD Introduces Hybrid HDD  
9/7/12 IOPS Survey - Second Request  
8/28/12 STEC SSD Survey Yields Surprising Results  
7/31/12 For the Lack of a Fab...  
7/31/12 PC Caching Software is Not All the Same  
6/26/12 SanDisk Acquires Schooner  
6/26/12 SMART Optimus Ultra+ SSD: SLC Performance Using MLC Flash  
6/25/12 SK Hynix Jumps into the SSD Market  
6/25/12 Seagate Invests in DensBits  
6//12 Link\_A\_Media Acquired by SK Hynix  
6/7/12 Link\_A\_Media's Roaring SSD Debut  
6/4/12 IOPS Survey  
5/30/12 The "Real" SSD Guy  
5/25/12 Toshiba Reveals Hybrid HDD Research  
5/7/12 Big Data? Move the App to the Data  
5/2/12 SSDs and Fast Erase  
4/30/12 DensBits Debuts with eMMC Controller  
4/28/12 Western Digital CEO: Hybrid Drives "Strategic"  
4/27/12 The SSD Pricing Maven  
4/26/12 The SSD You Can't Fly With  
4/19/12 Another Look at SSD Performance  
4/12/12 Intel Jumps Into the PCIe SSD Market  
4/3/12 Violin D-Round Values Company at \$800M  
3/26/12 Avnet's SSD Virtual Summit  
3/23/12 Micron: SSD Over-Inventory at OEMs & Channel  
3/12/12 SSDs and Server Consolidation  
3/1/12 OCZ: Three Solid State Storage Products in Three Weeks  
2/29/12 Kaminario white paper  
2//12 UCSD - Future SSDs Will Lack Performance  
2/8/12 Hitachi's New 2nd Generation SAS SSDs  
2/6/12 Fast New Intel SSD: The 520  
2/1/12 Standards for SSD Endurance  
1/29/12 The NAND Band!  
1/28/12 Video: How SSDs are Made  
1//12 How Will Thai Floods Impact the SSD Market?  
1//12 How to Locate a Storage Bottleneck  
1/18/12 Victorinox' Terabyte-in-Your-Pocket  
1/6/12 Fusion-io's Billion IOPS Monster  
12/19/11 SandForce: The Cloud needs Different SSDs

12/13/11 Apple to Acquire Anobit?  
11/28/11 Momentus XT  
11/23/11 DRAM vs SLC \$/GB  
11/22/11 Caching  
11/21/11 Fast Erase  
11/18/11 What Happens when SSDs Fail?  
11/17/11 SSDs and RAID  
11/15/11 SSD Garbage Collection  
11/14/11 Sometimes SSDs Don't Improve System Speed  
11/11/11 Are HDDs Obsolete?  
11/10/11 Not all SSDs are Created Equal  
11/9/11 When will SSD Prices Drop Below HDD Prices?  
11/8/11 Oracle Openworld  
11/7/11 The First SSD  
11/4/11 Seagate's Barracuda to Add Hybrids  
11/3/11 An HDD Cache for an SSD?  
11/2/11 What's the SNIA PTS?  
11/1/11 Thai Flooding & SSDs  
10/31/11 LSI Acquires SandForce

### ***The Memory Guy Blog***

12/2/14 Cypress to Merge with Spansion  
11/26/14 Memory Issues in Space & Medical Applications  
11/25/14 Obama Honors SanDisk Co-Founder  
11/5/14 Is Apple Losing Dollars to Save a Few Cents?  
10/9/14 Finally! Samsung's 3-Bit V-NAND Arrives  
9/30/14 New Book: Vertical 3D Memory Technologies  
9/19/14 Fundamentals of Memory - Free Online Course  
9/17/14 SanDisk's Amazing 512GB SD Card  
8/15/14 Cheesecake and Floating Gates  
6/24/14 Intel to Use Micron Hybrid Memory Cube  
5/22/14 Making 3D NAND Flash – Animated Video  
5/8/14 Samsung Begins Operations at its Xi'an Fab  
4/1/14 Researchers Devise 4-D Memory  
3/4/14 Spansion's Super-Fast HyperFlash NOR  
2/25/14 Comparing Samsung V-NAND to Micron 16nm Planar NAND  
2/4/14 Why NAND is So Difficult to Scale  
1/10/14 Did SK hynix Beat Samsung to the 8Gb LPDDR4?  
12/13/13 3D NAND: Who Will Make it and When?  
12/12/13 Rambus-Micron  
12/6/13 3D NAND's Impact on the Equipment Market  
12/5/13 What is a "Multilayer Cell?"  
11/29/13 How Do You Erase and Program 3D NAND?  
11/25/13 The Father of Flash Memory  
11/22/13 3D NAND: Benefits of Charge Traps over Floating Gates  
11/18/13 Micron Announces Processor-In-Memory  
11/15/13 3D NAND: How do You Access the Control Gates?  
11/12/13 DRAM Inventor Wins Kyoto Prize  
11/8/13 An Alternative Kind of Vertical 3D NAND String

11/5/13 SIA: Memories Drive Record Semi Revenues  
11/1/13 3D NAND: Making a Vertical String  
10/30/13 Hynix Recovery - Not so Soon?  
10/25/13 What is a 3D NAND?  
10/23/13 Why Facebook Can't Get its Dream Memory Chip  
10/18/13 Why Do We Need 3D NAND?  
10/13/13 Hynix Squeaks Out Another Update  
10/11/13 What is 3D NAND? Why do we need it? How do they make it?  
9/25/13 Micron Samples Hybrid Memory Cube  
8/5/13 Crossbar's Radical New Memory Technology  
8/5/13 Samsung Announces 3D NAND Production  
7/17/13 Micron NAND Reaches 16nm  
7/12/13 Applied's Take on 3D NAND  
7/2/13 SanDisk & Toshiba to Add NAND Capacity  
5/21/13 SanDisk & Toshiba Move to Next Process Node  
5/14/13 A Retrospect of Toshiba's NAND Production Cut  
4/4/13 Hybrid Memory Cube Making Progress  
4/1/13 New Memory Bonding Technique Shows Promise  
3/12/13 DRAM Prices on the Rise  
1/31/13 Why Do Memories Have Those Odd Names?  
12/3/12 Macronix Solves Flash Wear Problem  
12/2/12 History of Memory Slideshow in EE Times  
12/1/12 Why Most NAND Rankings Ignore SanDisk  
11/12/12 Everspin Samples First STT MRAM  
11/12/12 Spansion Introduces 8Gb NOR Flash  
11/2/12 Is there a NAND Shortage? Not quite.  
11/1/12 Top Ten Trends for NAND Flash  
10/31/12 Happy Birthday to The SSD Guy!  
10/10/12 Does the 'Windows Bump' Really Exist?  
10/9/12 Samsung Revenues Reflect NAND Price Increase  
10/3/12 Adesto Acquires Atmel's Serial NOR Business  
10/2/12 Kingston's 'Windows To Go' Thumb Drive  
9/27/12 Is NAND Headed for Lower Bit Growth?  
9/26/12 Alternative Memory Technologies Patiently Wait For Market to Explode  
8/13/12 Is DRAM Really a Profitless Business?  
7/24/12 Toshiba to Cut NAND Production by 30%  
7/24/12 Samsung DRAMs in Massive Leibniz SuperMUC  
7/18/12 Micron PCM Enters Mass Production  
7/2/12 A New Way to Build Phase-Change Memory (PCM)  
6/25/12 The End of Flash Scaling  
6/8/12 NAND Flash at 35 Cents per Gigabyte  
5/30/12 What is cMLC Flash?  
5/30/12 Why DRAM Bit Growth will Suffer  
4/30/12 DensBits - Making TLC Act Like MLC  
4/19/12 Why DRAMs are Like Steel  
4/13/12 Figuring Out Who Shipped What  
4/10/12 Invensas' DIMM-in-a-Package  
4/9/12 How Cheap is Flash?  
4/4/12 MOSAID Samples 333GB/s HLNAND  
4/3/12 NAND Flash Turns 25!

4/2/12 Hynix and Spansion Join Forces  
3/9/12 Remembering Core Memory  
2/29/12 IEEE Spectrum: Did Bad Memory Chips Down Russia's Mars Probe?  
2/28/12 Intel Sells NAND Assets  
2/27/12 Inside SanDisk's & Toshiba's New 128Gb NAND Chip  
2/24/12 How Do You Make an ReRAM Work?  
2/23/12 Harari Delivers Inspiring Keynote at ISSCC  
2//12 NAND SSD Performance to Decline over Time  
2/16/12 Micron Suffers Another Loss  
2/15/12 Elpida Finally Makes Statement  
2/14/12 Hynix is now SK-Hynix  
2/13/12 New NAND Player: Macronix  
2/6/12 Rambus Acquires Unity Semiconductor  
2/3/12 Micron CEO Killed in Plane Crash  
1/25/12 Elpida ReRAM Prototype  
1/16/12 Cypress vs. GSI Battle Following Rambus Lead  
12/26/11 DRAM Consolidation in 2012?  
12/14/11 WIOMING: Another Spin on the Hybrid Memory Cube  
12/13/11 What is a Content-Addressable Memory (CAM)?  
12/8/11 A Change to Computing Architecture?  
12/6/11 Micron, Intel, Introduce 128Gb NAND Chip  
12/2/11 IBM to Build Micron Hybrid Memory Cube  
12/1/11 Mission Statement