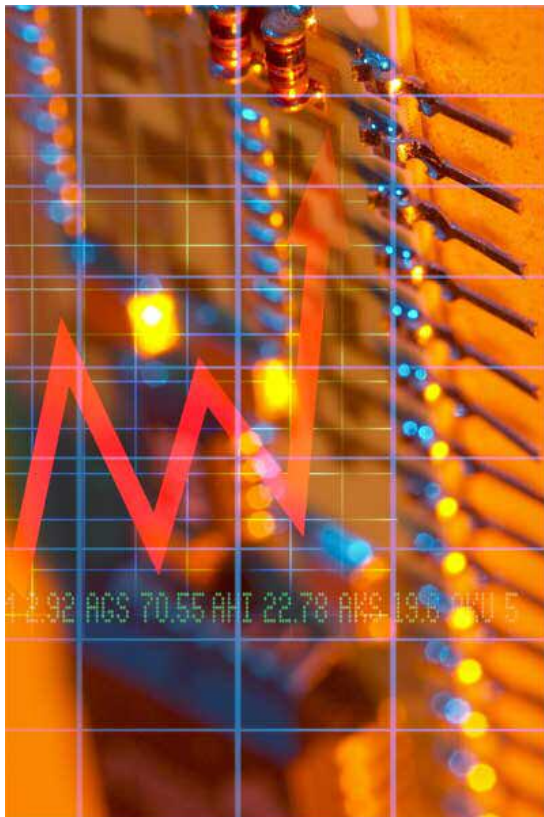




Technical Seminar Series

Be Smart — Choose the Right Part

Welcome to the 2006 Passive Market Outlook



Thank you for joining us!

Listen in as Dennis Zogbi and experts from KEMET, Littelfuse, Murata and Vishay provide a detailed market overview of the passives industry.

So, sit back, relax and learn what to look for in 2006!





Technical Seminar Series

Be Smart — Choose the Right Part

Welcome – Craig Conrad, TTI, Inc.

Market Overview

General – Paumanok

- Dennis M. Zogbi

Capacitors – KEMET

- J. Kelly Vogt

Circuit Protection – Littelfuse

- Jeffrey P. Ray

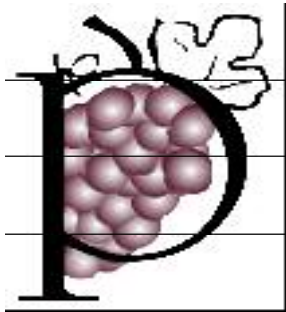
Ceramics – Murata

- Karun Malhotra

Resistors – Vishay

- Randy Pinkelman

1Q 2006



RESEARCH & PRESENTATION

Dennis M. Zogbi
President
Paumanok Publications, Inc.
(919) 468-0384
dennis@paumanokgroup.com

Passive Component Market Update 2006 Trends & Directions

1Q 2006

Capacitors

Resistors

Inductors



2006- Forecast Continued Regional Shift

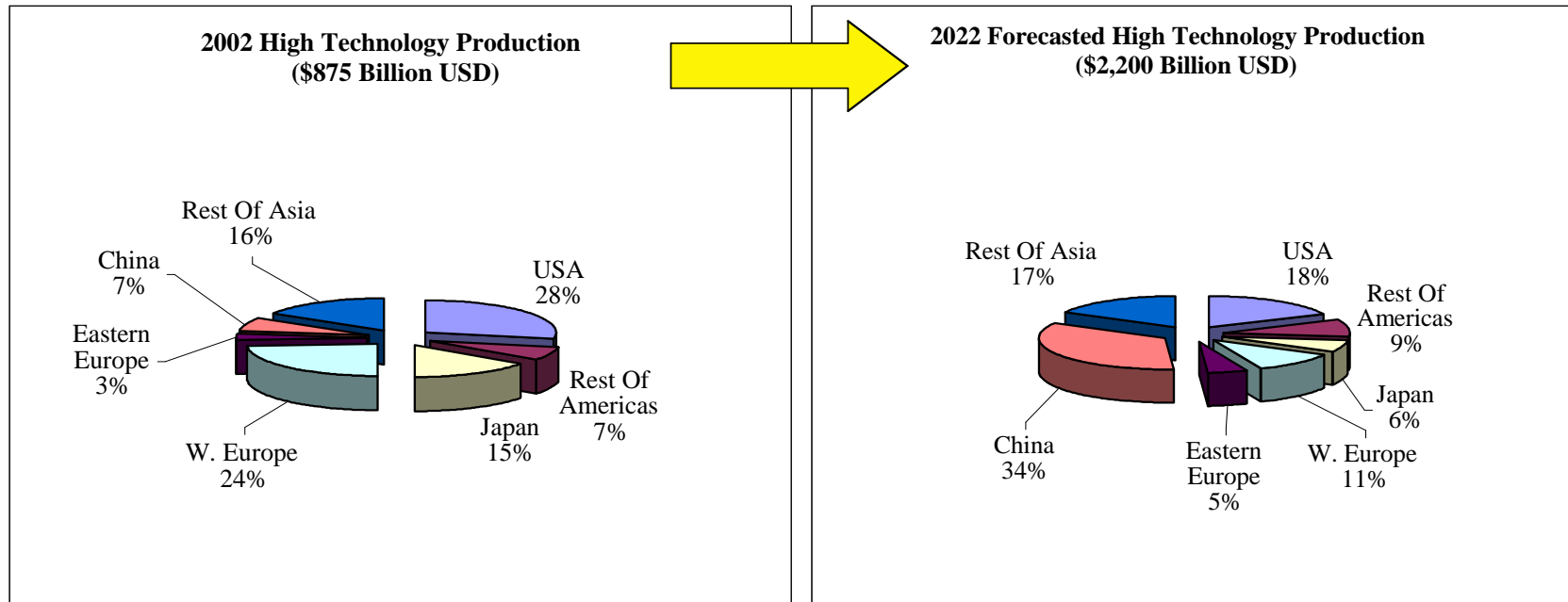
√ Mass Movement of Commercial Capacitor Production and Consumption to China

Top AVX Executive- “It’s like the US market split in half since 2000, half staying here and half Going to China. I think you could walk by ship from Seattle to Shanghai.”

√ Changing Footprint of Manufacturing in the USA, W. Europe and Japan to Value-Added and Application Specific Capacitor Production and Consumption



Forecasted Changes in Global Production of High-Tech Products: 2002 - 2022



2002 Trends : Production of Electronic Assemblies Now Moving Toward Low Cost Manufacturing, Primarily in Asia. This trend has been accelerated by the involvement of electronic manufacturing services (EMS) companies.



Assumption: Electronic Assembly Production remaining in high cost regions such as USA, Japan and Western Europe will be low volume, high value, mission critical assemblies. Passive Component production and sourcing will follow suit.



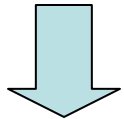
Conclusion: Capacitor production in the USA, Japan and Europe will begin to shift toward low volume, high value parts; while production in low-cost regions such as China, will continue to produce exceedingly larger volumes of commercial parts at exceedingly lower prices.



What is Going Where?

To China & SE Asia

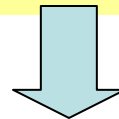
**Contract Electronic Manufacturing
Computers/Peripherals
Wireless Communications
Consumer A/V**



**65% of the High Tech Economy,
70-75% of Capacitor Sales**

What is Staying in the West

**Automotive Electronics
Telecom Infrastructure
Medical Test & Scan
Medical Implants
Downhole Pump Electronics
Industrial Automation
Defense Electronics**



**35% of the High Tech Economy,
25-30% of Capacitor Sales**



Value-Added & Application Specific Component Definitions

Examples of value-added capacitors:

- A) Automotive under-the-hood
- B) Low ESR/ESL for power supply input filter (Interdigitated)
- C) Low ESR tantalum capacitors (polymer cathode)
- D) Low ESR aluminum capacitors (polymer cathode)
- E) AC & Pulse film capacitors (Degaussing circuit)
- F) Interference Suppression Capacitors (X & Y series)
- G) AC film for power factor correction

**Combination of
the Two Results
in the Greatest OP**

Examples of Application Specific Capacitors:

- A) High Voltage Greater Than 500 Vdc to 60 kV
- B) High Frequency Capacitors > 1Ghz to 100 Ghz
- C) Tantalum Wet-Slug Capacitors to 125 Vdc
- D) Tantalum Capacitors for hearing aids, pacemakers
- E) Pulse/Flash aluminum capacitors (medical implants, strobes)
- F) Power Film Capacitors (Variable Speed Drives)
- G) Pulse Power Film Capacitors (Power Supply, Microwave Oven)



Higher Priced, Higher Margin Markets

↑	Highest Price/Margin	High Voltage and High Frequency Ceramic Capa
	High Price/Margin	High Voltage & High Frequency Ceramic Capacitors
	Medium Price/Margin	Standard Ceramic Capacitors-Value Added
	Low Price/Margin	Standard Ceramic Capacitors

Low ← Technology Requirements/Investment Requirements → High

Value-Added implies testing for high temperature, harsh environment, vibr

The Strategic Theory
If the Vendor Makes Profits in One Sector, He Can Cut Price in the Other Sector



Market Size & Operating Margins for Fixed Capacitors by Type: 2005

<i>Profitability Equations For Passive Component Suppliers</i>	<i>% of Total C,R,L Revenues</i>	<i>% Of Total C,R,L, Volume</i>	<i>Operating Profit Margins</i>
Mass Commercial Markets	69%	85%	6%
Value-Added Markets	21%	12%	25%
Application Specific Markets	10%	3%	45%

**Large Revenues
are in the Mass
Commercial Markets**

**Smaller Volumes
are in the Value-Added
and Application Specific
Markets**

**Larger Operating
Margins are in
the Value-Added
and Application
Specific Segment**



Requirements for Value-Added & Application Specific Component Markets (High Margins)

Component Requirements

- √ High Frequency (>1Ghz)
- √ High Heat Withstand (125-200°C)
- √ High Vibration Resistance
- √ Corrosion Resistance
- √ Altitude Resistance
- √ NEMP/Radiation Resistance
- √ Special Packaging
- √ Other

Vendor Requirements

- √ Advanced Test Capabilities
- √ Agency Approvals
- √ Customer Access
- √ Market Intelligence

**Roadblocks to Market Entry
for Many Major Competitors**



Competitive Growth Strategies in Passive Components Through Acquisition

Compartmentalized Component Solution

“A Distributor W/O the Mark-Up”

- √ Vishay
- √ EPCOS
- √ Matsushita
- √ Kyocera/AVX
- √ SEMCO

This Model Services CEMs and Asian Markets Best
Operating Margins Average 6%, But Economies
of Scale Are Massive

Value-Added & Application Specific Solution

“High Voltage, High Frequency, High-Rel
Component Solutions for Demanding
Environments”

- √ Dover
- √ ATC
- √ TT Electronics
- √ Johanson
- √ Spectrum
- √ Many Others

(Diverse & Fragmented)

This Model Services OEM Customers Staying in the West
Operating Margins Average 15-50%, But Economies of
Scale are Small



2006- Solution To The Regional Shift

√ Continued Movement Of Mass Production and Mass Consumption To Greater China.

√ USA and Europe Production & Consumption Becomes More Focused On High End Products. Manufacturing Footprints Should Be Consistent With These Regional Shifts.



Key Maxims

√ **Capacitance and Resistance is Required to Complete an Electronic Circuit. Thus consumption is in the trillions of pieces.**

√ **Capacitance and Resistance is Equivalent to Physical Size of the Component's Available Surface Area.**

Thus Raw Materials Are A Major Cost Of Production.



Weighted Average of Passive Component Consumption by End-Use Market Segment: 2004 (Revenue-Based)

Weighted Average of Passive Component Consumption Value by End-Use Market Segment: 2004

<u>Segment</u>	<u>%</u>	
Consumer A/V	31%	→ EBIDTA= 5%-10%
Computer	24%	
Wireless	17%	
Automotive	10%	→ EBIDTA= 25%-65%
Telecom	8%	
Defense	3%	
Medical	2%	
<u>Other</u>	<u>5%</u>	
Total	100%	



2006 Global Passive Component Forecast By Type

Units (Billions)	2004	2005	2006F	2005-2006
Capacitors	909	1,056	1,177	11%
Resistors	872	931	1,015	9%
Inductors	51	60	66	10%
Total	1,832	2,047	2,258	10%
Value (Millions of USD)	2004	2005	2006F	
Capacitors	\$13,581	\$15,026	\$15,902	6%
Resistors	\$3,538	\$3,711	\$3,895	5%
Inductors	\$1,743	\$1,927	\$2,025	5%
Total	\$18,862	\$20,664	\$21,822	6%
Price (USD)	2004	2005	2006F	
Capacitors	\$0.0149	\$0.0142	\$0.0135	-6%
Resistors	\$0.0041	\$0.0040	\$0.0038	-5%
Inductors	\$0.0342	\$0.0321	\$0.0310	-4%
Total	\$0.0102	\$0.0101	\$0.0096	-5%



Global Sales & Market Shares in Core Passives: 2005 (Capacitors, Resistors & Inductors)

Vendor	Capacitors	Resistors	Inductors	Integration	Precision	%	Rank	Public
TDK	∴		∴	∴	∴	9.40%	1	Public
Murata	∴		∴	∴	∴	8.30%	2	Public
Vishay	∴	∴	∴	∴	∴	7.30%	3	Public
Matsushita	∴	∴	∴		∴	7.00%	4	Public
Kyocera/AVX	∴				∴	6.40%	5	Public
Taiyo Yuden	∴		∴			5.50%	6	Public
EPCOS	∴	∴	∴	∴	∴	4.80%	7	Public
Nichicon/Tianjin	∴				∴	4.10%	8	Public
Nippon Chemi-Con	∴				∴	3.70%	9	Public
Yageo	∴	∴	∴	∴		2.90%	11	Public
Kemet	∴			∴		2.60%	12	Public
Rubycon	∴				∴	2.50%	10	Private
KOA	∴	∴		∴	∴	2.40%	13	Public
Rohm Electronics	∴	∴		∴		2.30%	14	Public
Tokin/NEC	∴		∴			1.80%	15	Public
Arcotronics	∴				∴	1.80%	16	Private
Sanyo Capacitor	∴				∴	1.80%	17	Public
TT Electronics		∴		∴	∴	1.00%	18	Public
VOGT			∴		∴	1.00%	19	Public
Other	∴	∴	∴	∴	∴	23.00%	20	Second Tier
Total	∴	∴	∴	∴	∴	∴	All	



Paumanok Key Component Watch: 2006

√ Ultra-Small Case Size Molded Tantalum Chips (P,J Case)

- Market Drivers: Camera Phone, Video Camera {Trend}

√ V-Chip Aluminum Electrolytic Capacitors (6x8mm, 8x10.5mm and 10x10.5 mm)

- Market Drivers: Flat Panel Display, MPU, Graphics

√ High Capacitance BME MLCC

(2.2 to 100 μ F) (47 μ F X5R 1206 6.3 Vdc key part)

- Market Drivers: Wireless, And PC

√ Niobium-Oxide Capacitors

- Replacement of Ta chips in computer CPU, Other

√ Polymer Tantalum and Polymer Aluminum

- Semiconductor Decoupling; Audio Circuits

A Video Revolution

*Sample Vision Statement
Maximizing Revenues
Through Value-Added
Approach to Markets,
Technologies
& Opportunities*

A Digital Convergence



Emerging & Growth Technologies

EDLC Supercapacitors

Activity in Automotive and Bus Applications in USA, Europe and Japan (NCC, Nichicon- Big Plans)

Niobium Capacitors

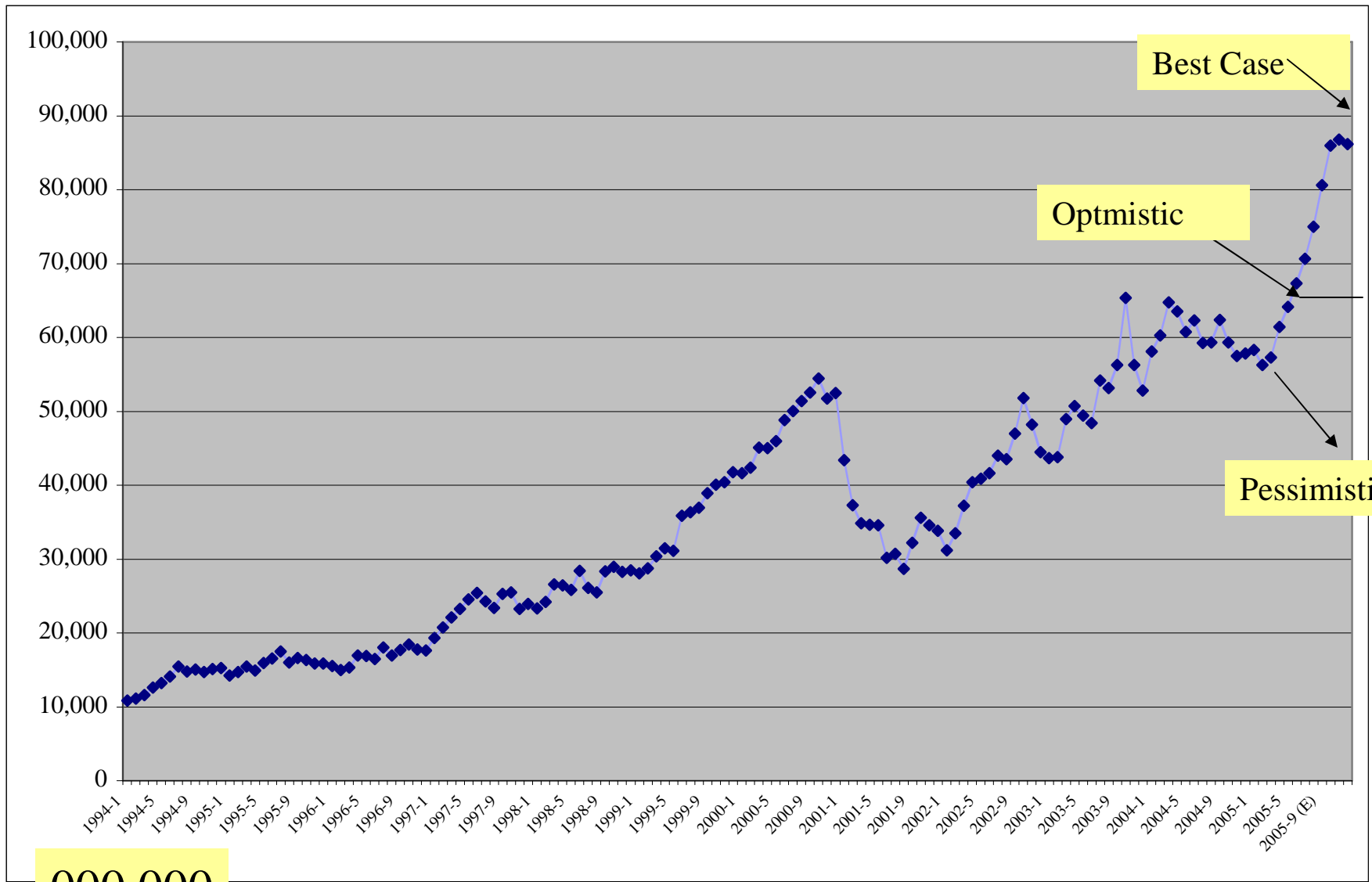
Massive Education Program Underway by Vendors, Especially for AVX OxiCap[®]- Massive Increase in Production

Passive Integration

Considerable Activity in LTCC and FR4 Module Integration; IPD Integration is Driving 0201 and 01005 Case Size Demand



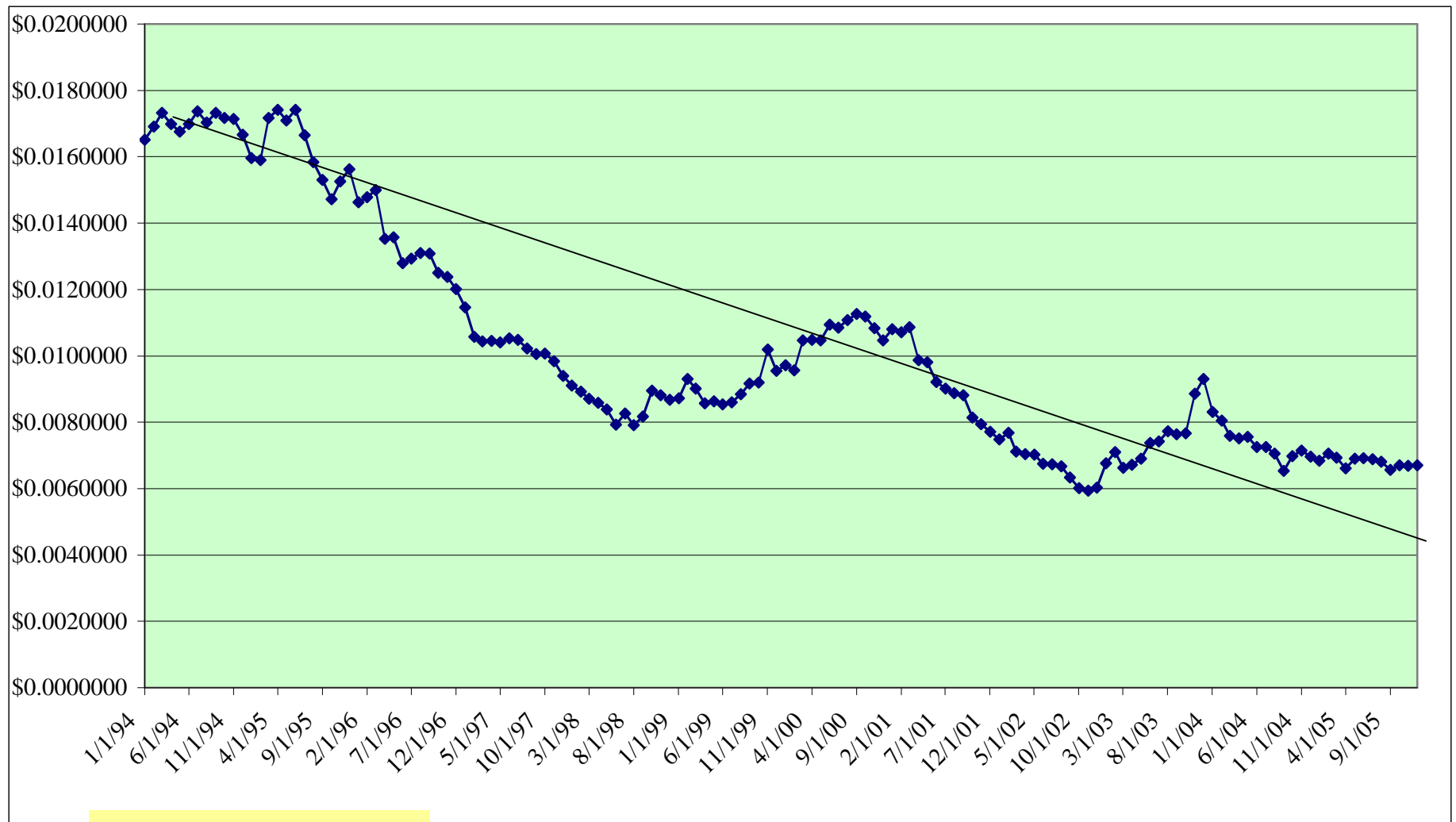
Global MLCC Consumption Volume By Month: 1994-2005



000,000



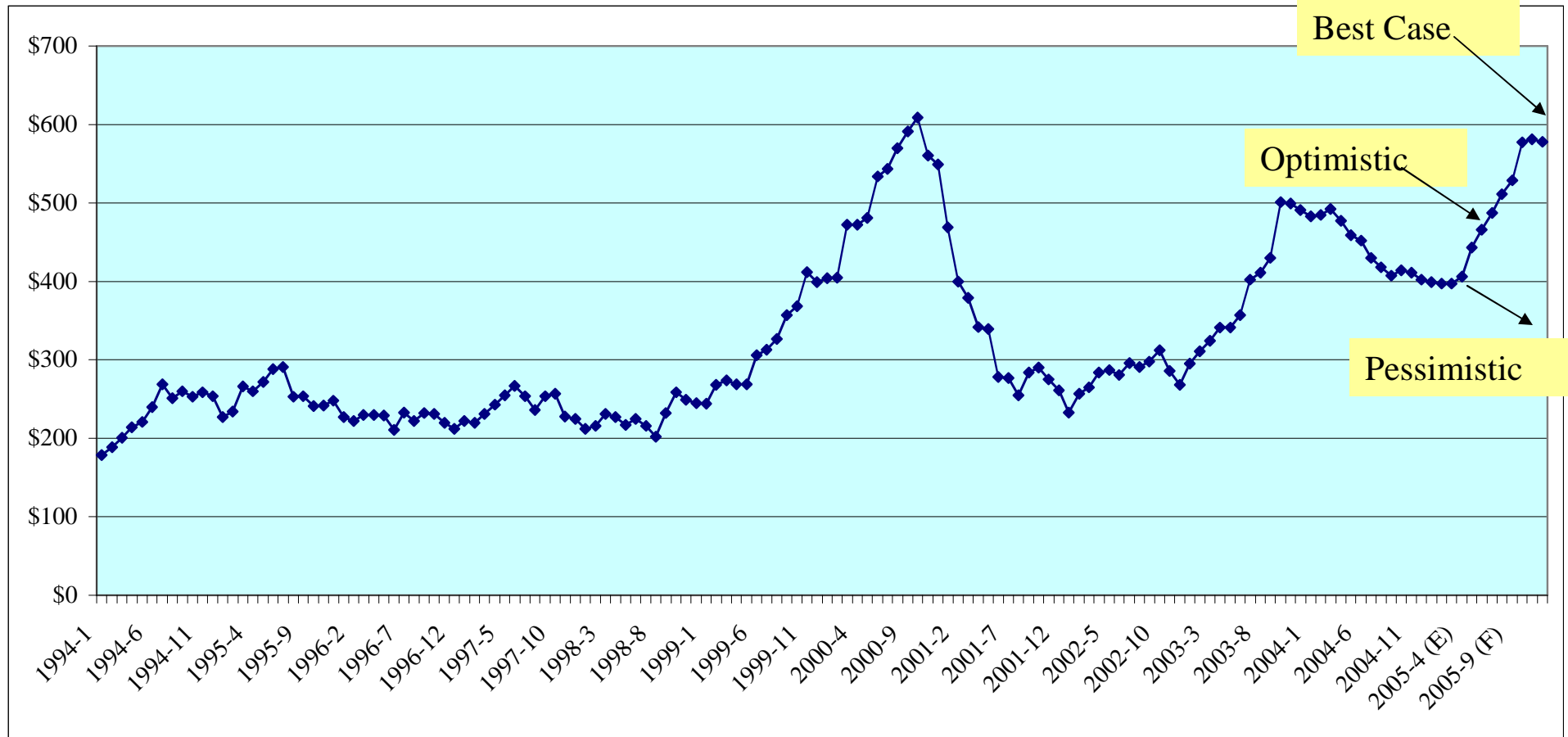
Global MLCC Average Sales Price By Month: 1994-2005



\$USD Per Unit



Global MLCC Sales Value By Month: 1994-2005



\$000,000



Summary: 2006 Outlook

- √ **In 2006, the Global High Tech Economy Will Grow at a Rate of 6%**
- √ **Commercial Markets Moving to China/Asia Will Continue Through 2005, Most will be Completed by Year-End but Valuation of Yuan is a Serious Issue**
- √ **The West Will Continue to Reflect Demand for Value-Added and Application Specific Products. A Smaller Revenue Base but Larger Gross Margins**
- √ **The Five Year Passive Component Cycle is Staying True to Form but Will Come in Two Growth Spurts-- 1 Half 2006 and 1 Half 2007**
- √ **Key Growth Components Include: Tantalum Polymer, Niobium Oxide, V-Chip Aluminum, Ultra Small Tantalum, High Cap BME MLCC, DC Film Chip, Precision Resistors, High-Q Inductors, MLV, PPTC and NTC Thermistors.**

