



TTI Marketing  
Outlook Webcast



Capacitors - Vogt



## Tantalum & Ceramic Capacitor Overview

- Market Trends
  - Consumption
  - Price
  - Lead Time
- Material Trends
  - RoHS
  - Supply Chain
- Technology
  - Industry Trends
  - Industry Drivers



Market Trends

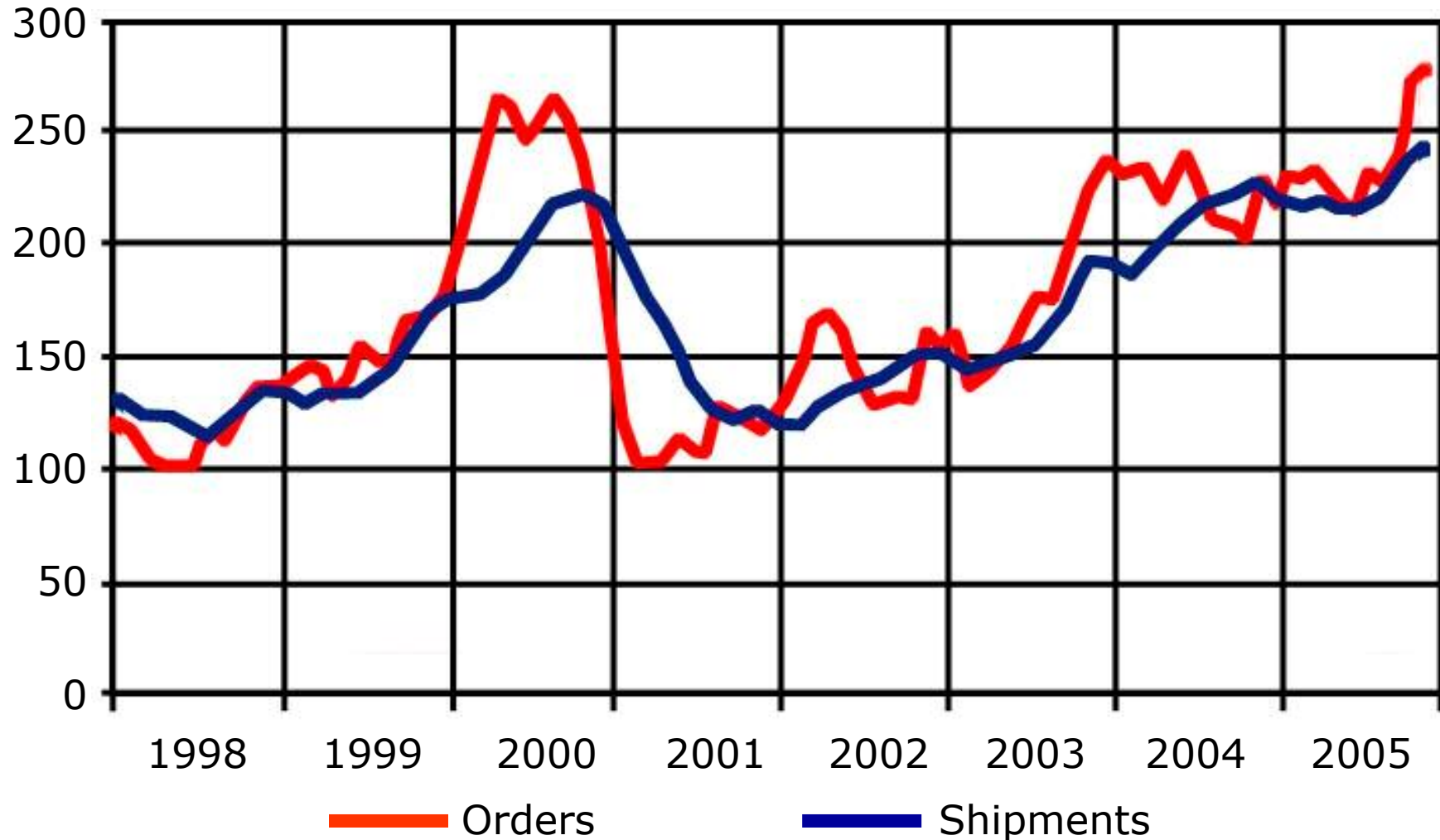


Consumption, Price  
and  
Lead Time



# Global Semiconductor Industry

## \$Billion, 3-Month Moving Average

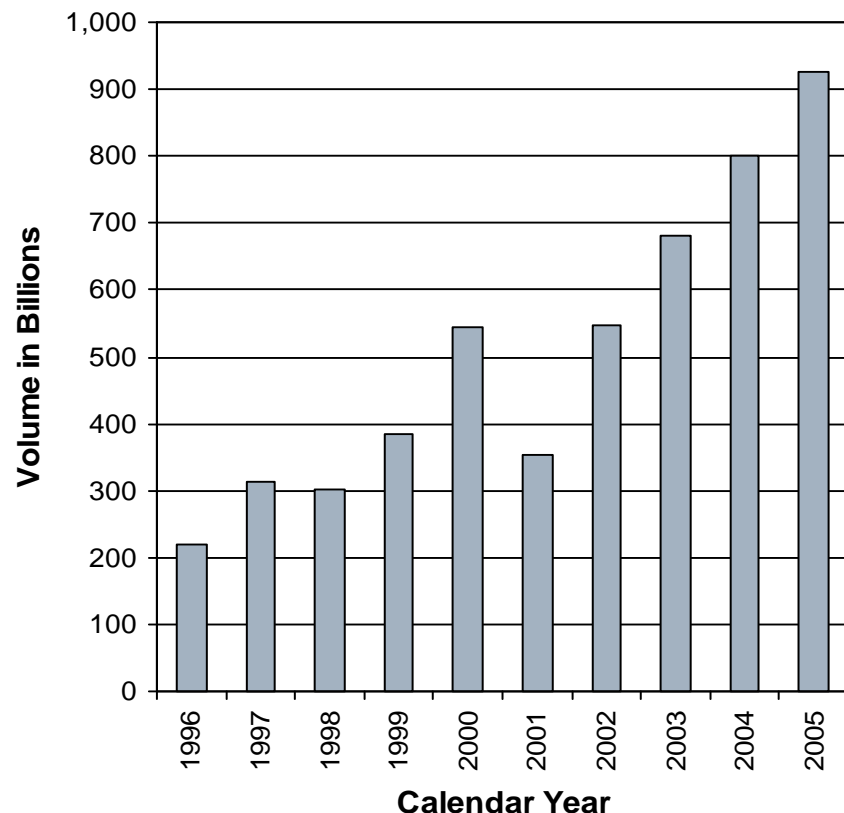


Source: Henderson Electronic Market Forecast (January 2006)



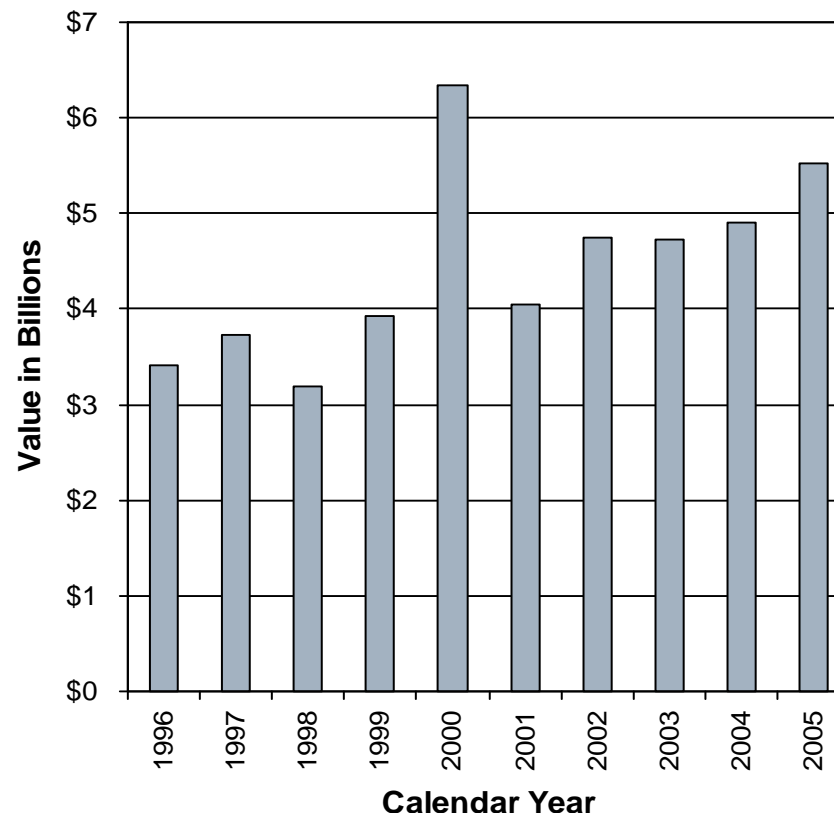
# Global MLCC Capacitor Industry Shipments

## Volume



**3 yr. CAGR '03 to '05: 16.5%**  
**5 yr. CAGR '01 to '05: 27.3%**  
**10 yr. CAGR '96 to '05: 17.3%**

## Value

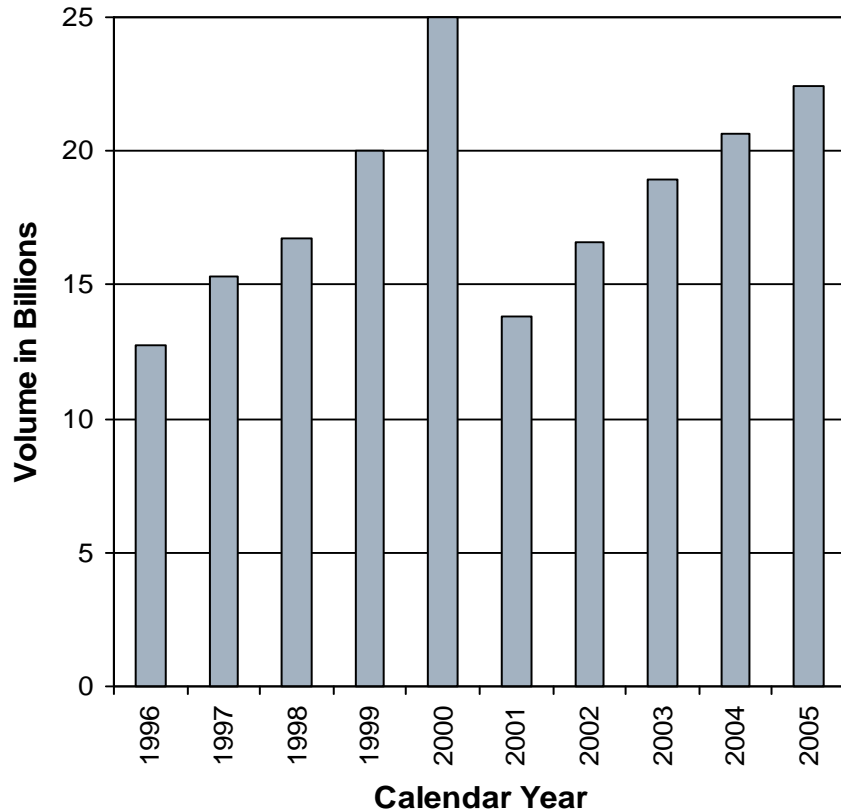


**3 yr. CAGR '03 to '05: 8.2%**  
**5 yr. CAGR '01 to '05: 8.2%**  
**10 yr. CAGR '96 to '05: 5.5%**



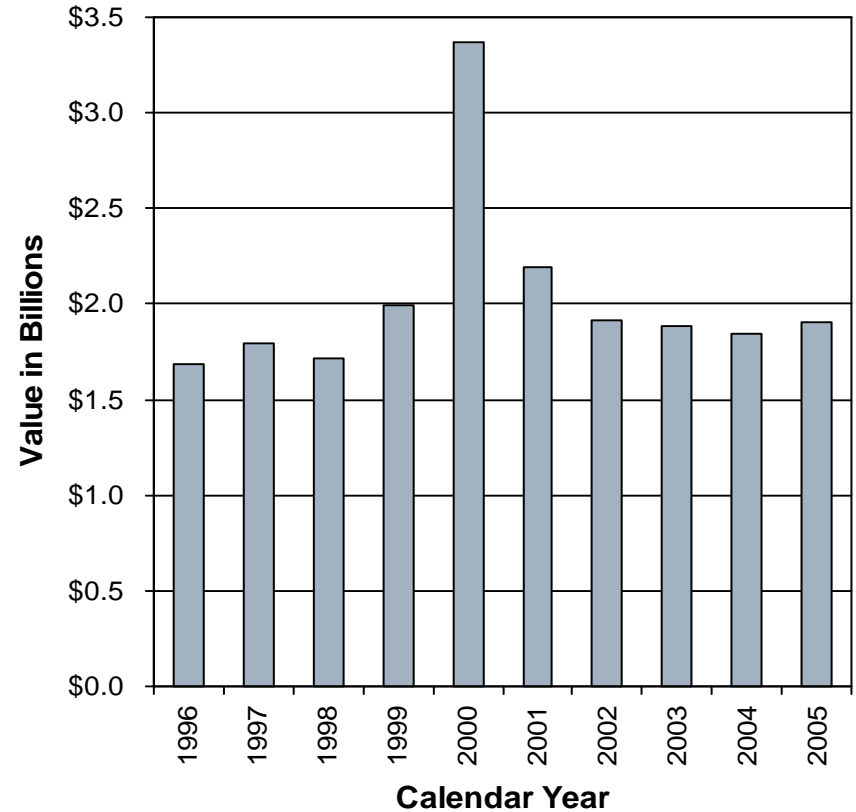
# Global Tantalum Capacitor Industry Shipments

### Volume



**3 yr. CAGR '03 to '05: 8.7%**  
**5 yr. CAGR '01 to '05: 12.8%**  
**10 yr. CAGR '96 to '05: 6.4%**

### Value

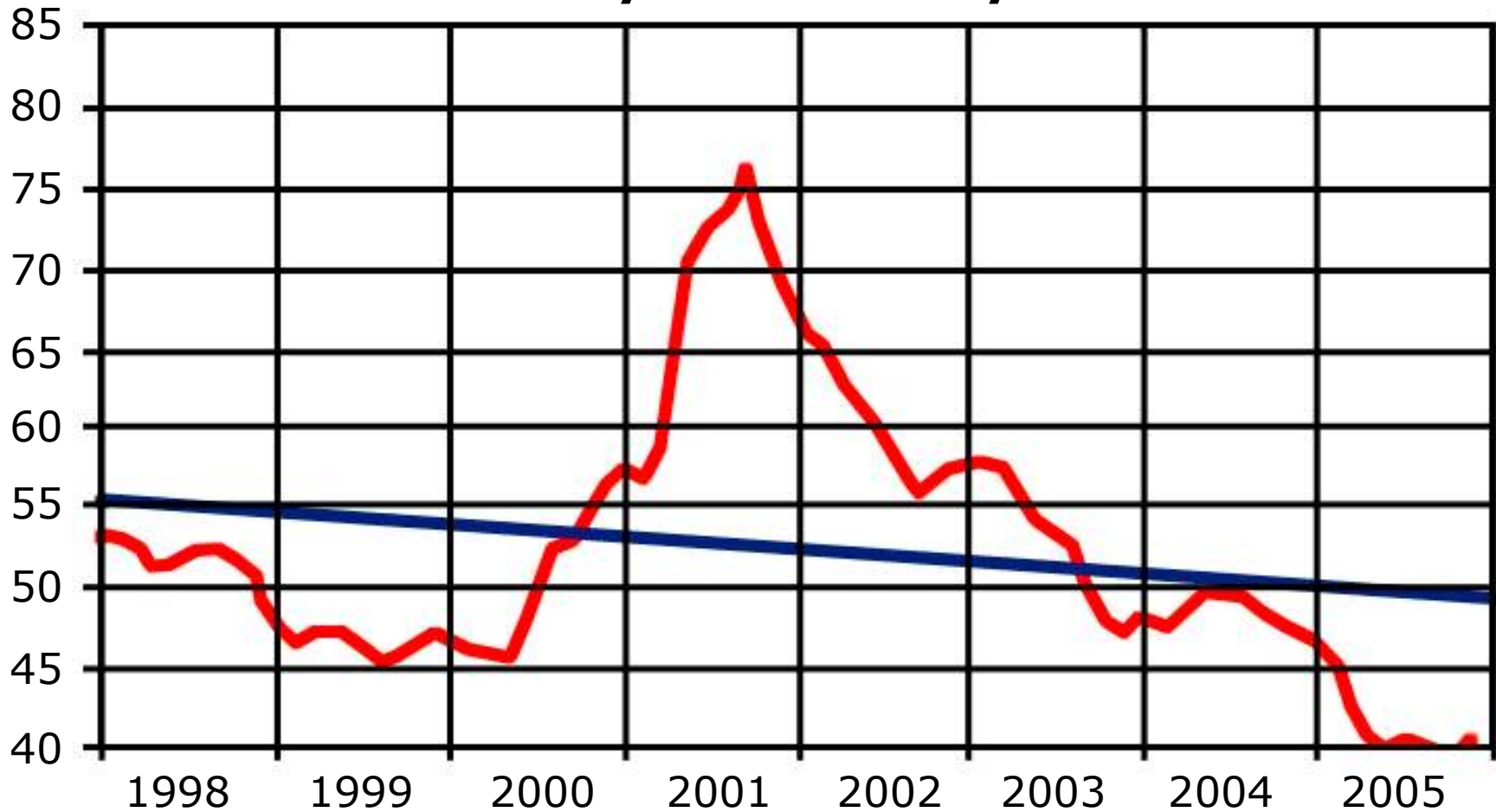


**3 yr. CAGR '03 to '05: 0.5%**  
**5 yr. CAGR '01 to '05: -3.5%**  
**10 yr. CAGR '96 to '05: 1.4%**



# U.S. Passive Component Industry

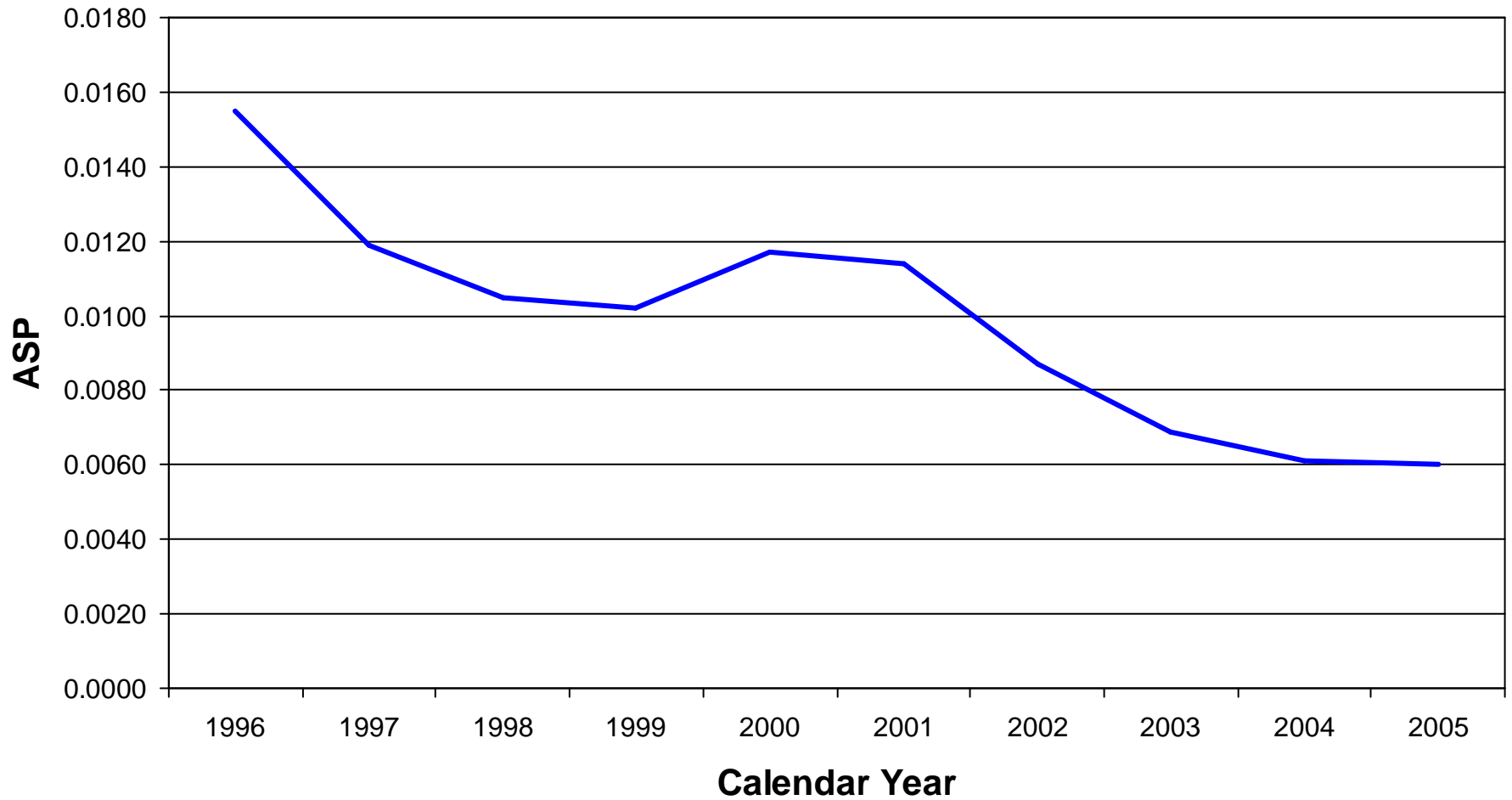
## Days of Inventory



Source: Henderson Electronic Market Forecast (January 2006)



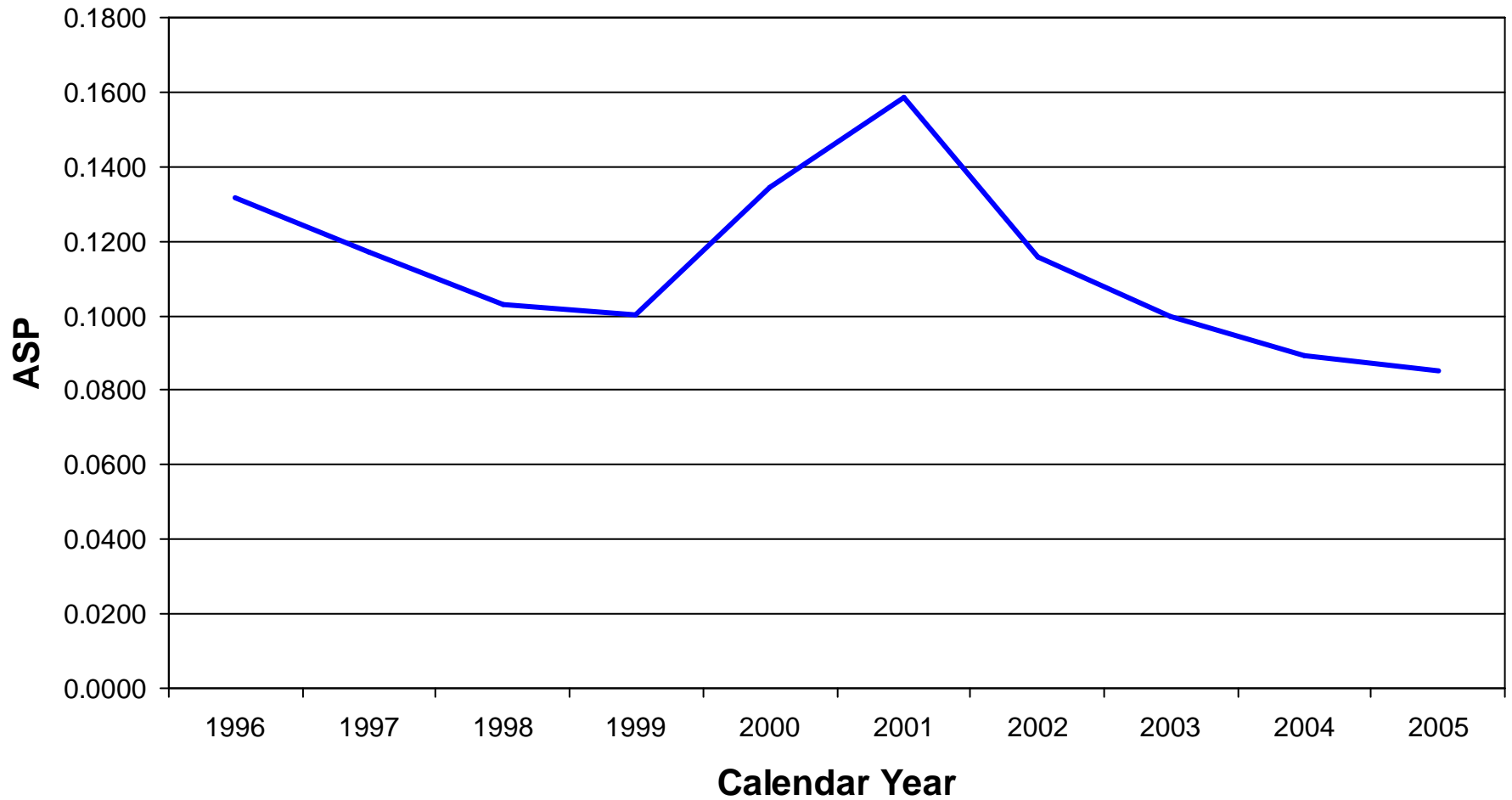
# Global MLCC Capacitor Industry ASP



Sources: Based on World Cap and Company Estimates



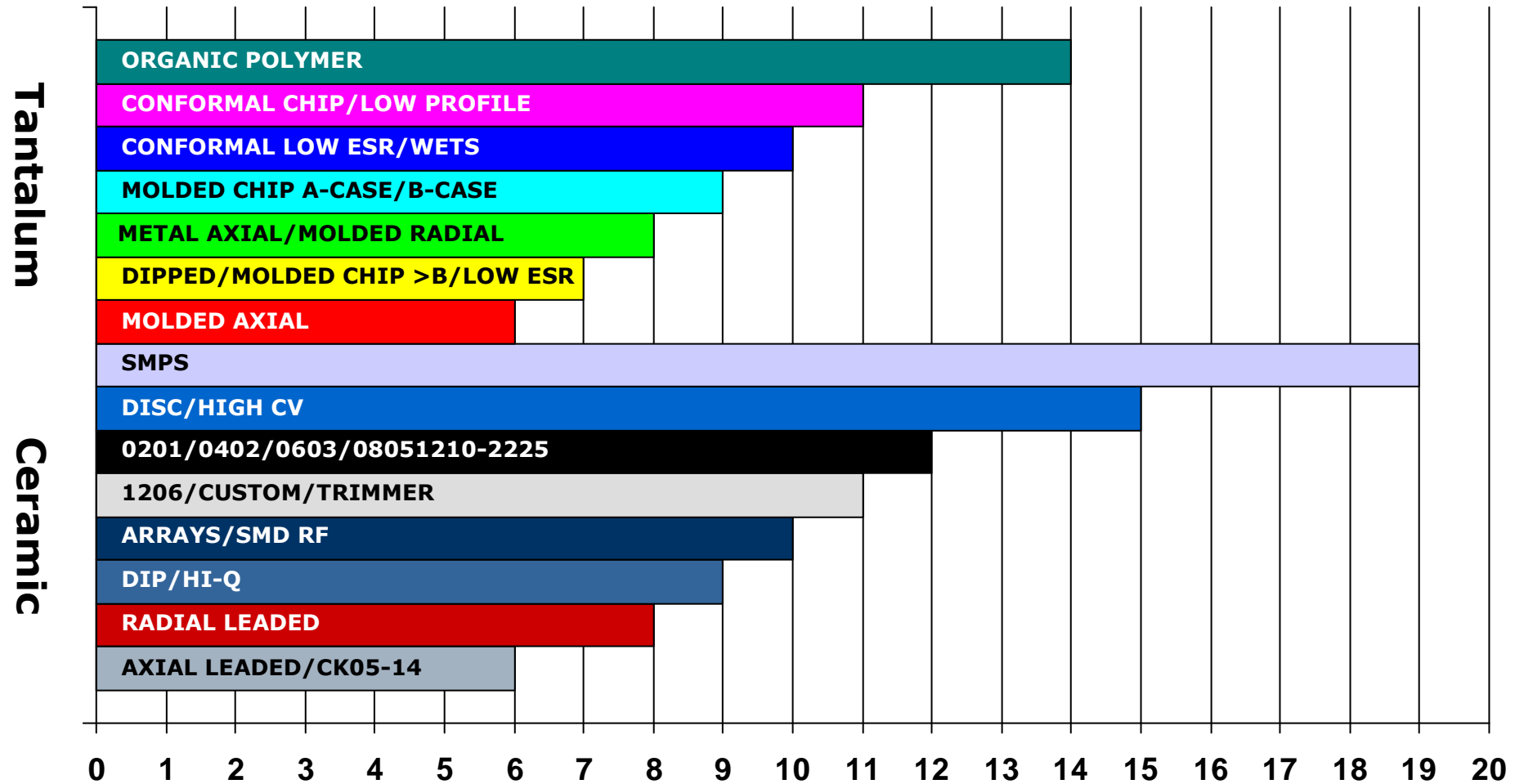
# Global Tantalum Capacitor Industry ASP



Sources: Based on World Cap and Company Estimates



# Lead Time Graphs in Weeks







## RoHS – Industry Impact

- Compliance is
  - not an option
  - a total product life cycle issue
  - part of the total cost of ownership

### Before RoHS

- TQM
- TQRD-C

### Now

- TQEM
- TQRD-CE



## RoHS – Capacitor Industry Impact

- Products
  - Products that need to be compliant are available
    - Demand for exempted applications (MIL / Hi-Rel / Server) still strong
    - Many retained or introduced SnPb termination ability for this demand
  - Conversion impact not significant for surface mount devices (SMDs)
  - Some minor challenges for pin through-hole devices (PTHs)
- Logistics
  - Product Identification
    - Various approaches, same part number vs. unique part number
  - Labeling
    - Standard addressing RoHS compliance labeling does not exist
    - Many rely on the JEDEC (active components) JESD-97 spec
      - Addresses Pb-free labeling only
    - Association Connecting Electronic Industries (IPC) agreed to include “RoHS” labeling somewhere
  - Other concerns
    - Counterfeiting
    - Inventory Management
    - Extended Supply Line Inventories



## RoHS – Capacitor Industry Impact

- Customer Response
  - Supplier Declarations
    - From yes/no to PPM for RoHS 6 to Full Declaration
    - Request criteria and format becoming more consistent
    - Volume of requests continues to increase
    - Industry looks to IPC 1752 for further standardization
  - 3rd Party Testing
    - Some customers require it as verification of declaration
    - Expense and laboratory methods and accuracy are concerns
  - Customer Testing
    - Incoming inspection or specified interval
    - Commonly used methods (i.e., XRF) yield misleading or erroneous results
      - Differentiate elements or compounds present
        - Example: Hexavalent Chromium vs. other Chromium content
      - Location or use, i.e., may be covered by an exemption
        - Example: Lead (Pb) content in COG ceramic capacitors



## RoHS – Capacitor Industry Impact

- Liability
  - No case law exists.....yet
  - No clear meeting of the legal minds
  - Manufacturers try to strike balance between adequate coverage, cost management and too much exposure / risk
- Impact of Emerging Legislation
  - EU's REACH and EuP
  - China's RoHS equivalent, others?
  - Future revisions to the EU's RoHS Directive
  - US State Legislation, i.e. CA Props 20 & 50
- Standardization (J-STD-020, etc.) heavily influenced by actives
  - JEDEC very active with IPC, iNEMI, EICTA, etc.
  - Some requirements designed for ICs don't translate well to passives
  - Cap manufacturers have to improve this through ECA or other means



## Supply Chain Issues

- Tantalum
  - Raw Material ✓
  - Powder Processing Capacity ✓
  - Lead-Frame Material ✓
  - Epoxy ✓
  
- Ceramic
  - Barium Titanate ✓
  - Metals ✓
  - Carrier Film ✓



Technology



Industry Trends  
and Drivers

- Expanded use of SMT
    - Smaller and Portable Products
  - Applications
    - Reduced Operating Voltages
    - Increased frequencies
    - Increased functionality
  - High Temperature Environments (Automotive)
- Reducing Number of Circuit Connections
  - Increased Reliability Demands
  - Concern about failure modes
  - Lead (Pb) Free/Environmental Issues
  - Declining Cost of Ownership
  - Lower system costs



- Increased Volumetric Efficiency
  - Capacitance Extension
  - Miniaturization
  - Increasing Complexity/Functionality
- Lower ESR/ELS
  - Improved performance
- Alternative Materials
- Cost Reduction
- All Of The Above Without Compromising:
  - Reliability
  - SMT Robustness





TTI Marketing  
Outlook Webcast



Capacitors - Vogt