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# NDIA Trusted Microelectronics Joint Working Group

**Dr. Daniel Radack**
**Institute for Defense Analyses**

*NDIA Trusted Microelectronics Workshop*
*August 16, 2016*

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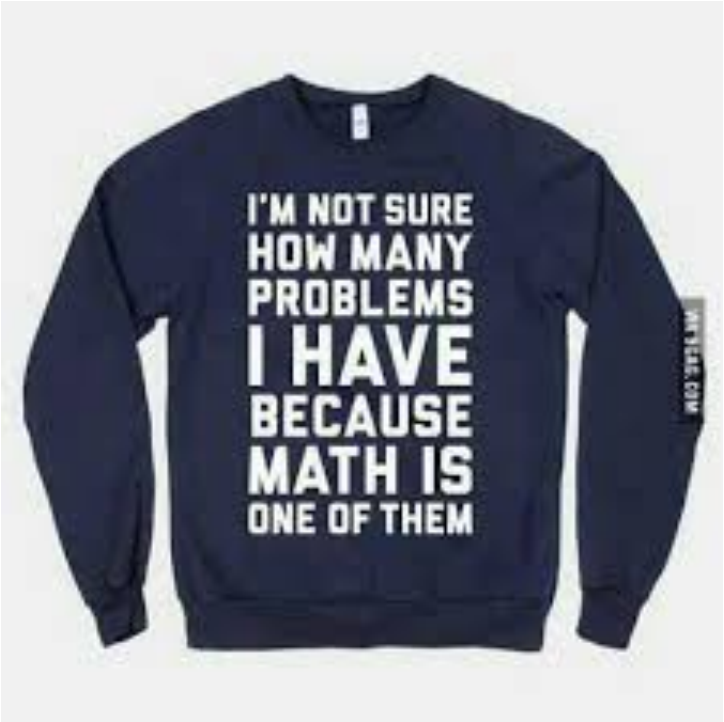
# There Isn't One Problem…

- Cost of Design
- Specialty technologies access
- Trusted fab access
- Any fab access
- Globalization of industry
- Supply Chains and Cyber
- Counterfeits, Clones, loss of IP
- Mismatches to commercial; long product cycles
- Over-dependencies that lead to bigger problems
- …



# Many Groups Studying the Path Forward for DoD Microelectronics

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- **Study groups or teams evaluating options:**
  - DSB – high level guidance
  - USD AT&L – supply chain requirements in absence of IBM
  - DMEA – matching Trusted supplier base to requirements
  - DMEA/PIPS – tiers of trusted standard or catalog products (non-ASICs)
  - IDA – options to replace IBM's technology capabilities
  - ODASD(SE) – trustworthy framework development
  - MIBP – voice of industry
  - GPS Wing – technology options study
  - NAS/AF Studies Board – Optimizing AF Acquisition of Secure and Reliable Electronics
  - MEC MWG – A Strategic Framework for Microelectronics
  - NNSA – Microelectronics Fab Analysis of Alternatives
  - ODASD(SE) – FPGA way forward

***Limited Industry Involvement . . . Established Trusted Microelectronics Joint Working Group to Connect Industry and Government Perspectives***

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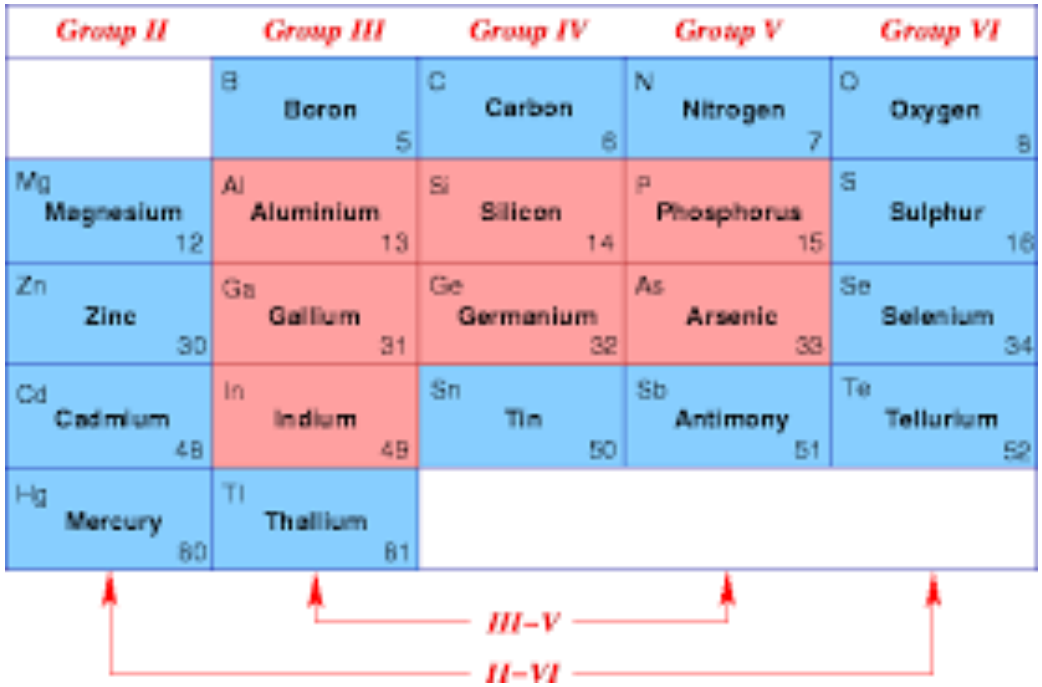
# Chemistry




- **This talk is focused on Silicon and basics of semiconductor industry**
  - Scene setting intention
- **How we got to the point of holding these workshops, forming Joint Working Groups, and the current focus from USG on subject**
  - It will leave out a lot of the details

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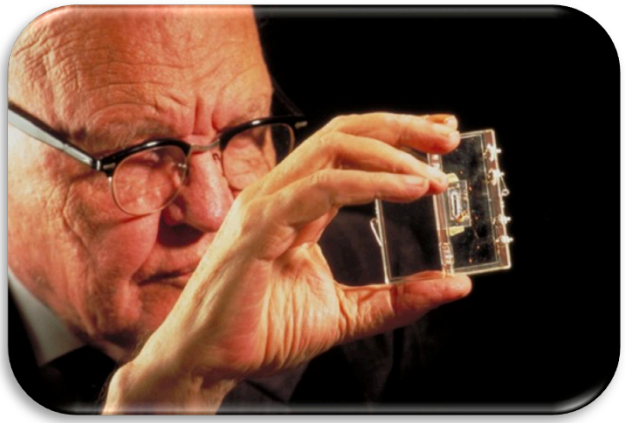
# Early Microelectronics

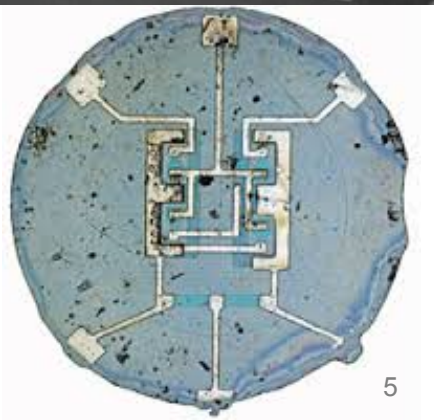


***DoD and NASA were primary research sponsors and early customers***

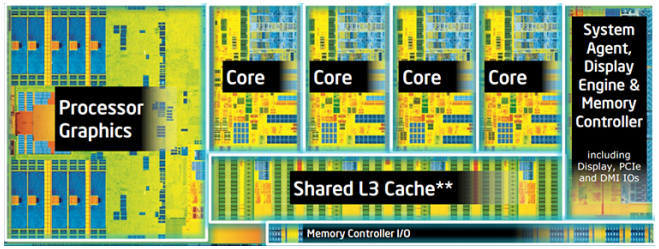
***Design and manufacturing by small, self-contained teams***

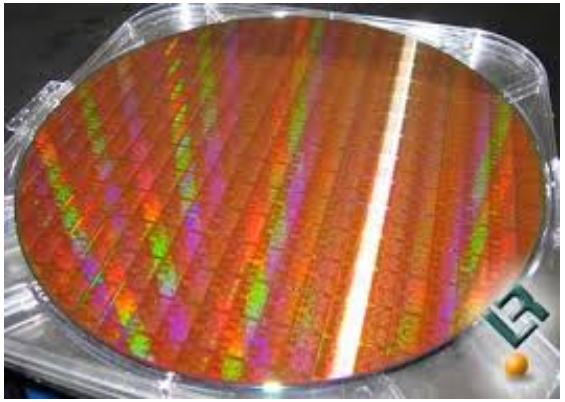
***Performance; reducing costs key focus***

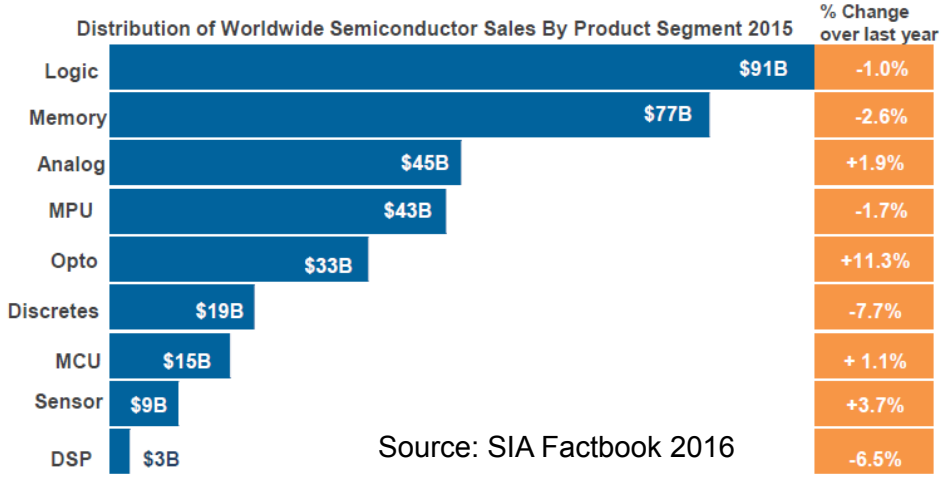
***Competitive domestic supplier base for DoD***



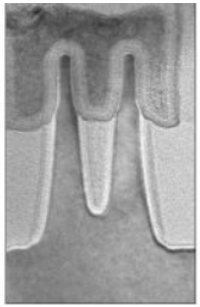
# Today

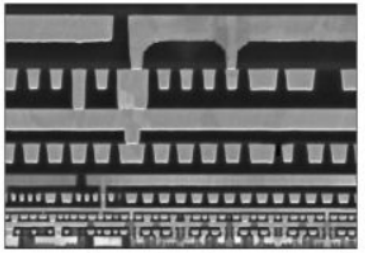


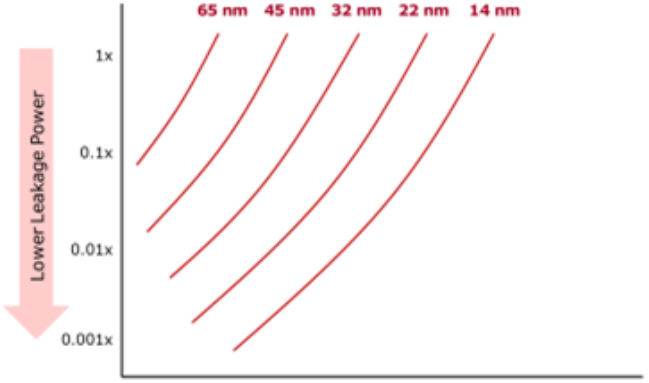



Source: SIA Factbook 2016





52 nm (0.65x) minimum pitch



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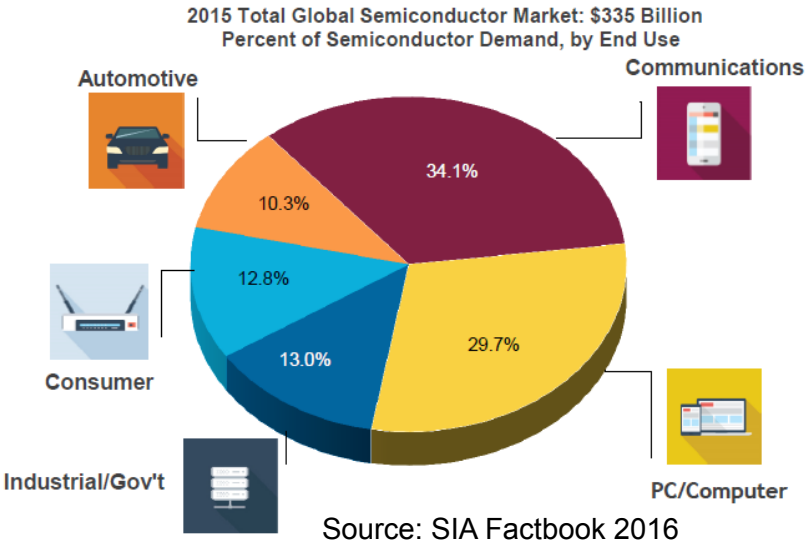
# Markets and End Uses

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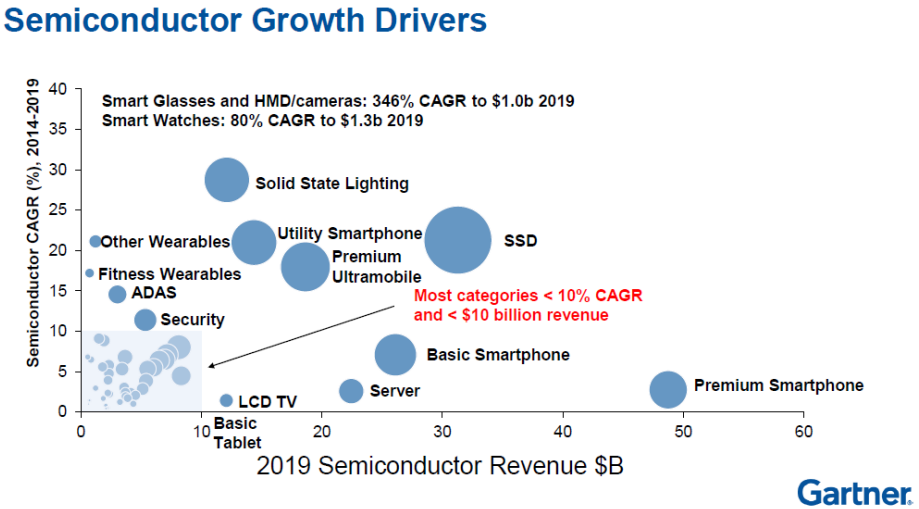


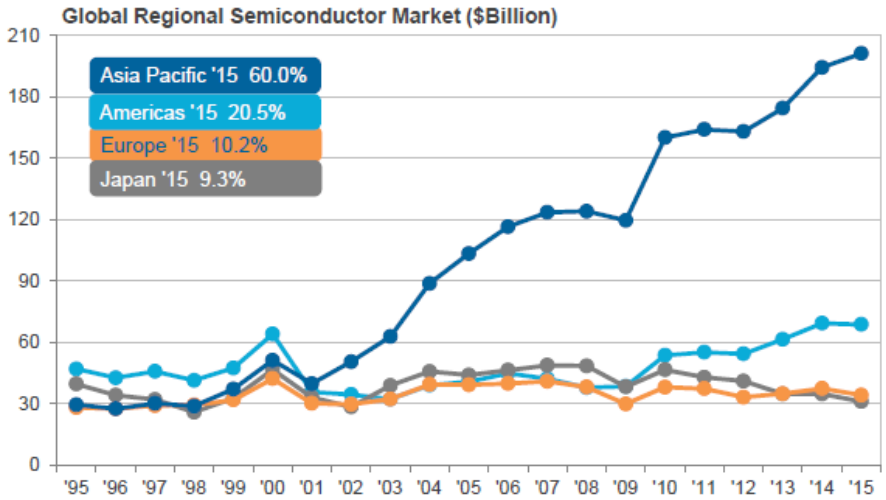


Source: SIA Factbook 2016

- >1.4 billion cell phones sold in 2014
- (320M Samsung; 225M Apple; 107M Huawei; 72M Lenovo; 65M Xiaomi; 635M everyone else)
- ~288M PC's sold in 2015 (-8% decline)
- Growth expected in Automotive, Industrial, IoT

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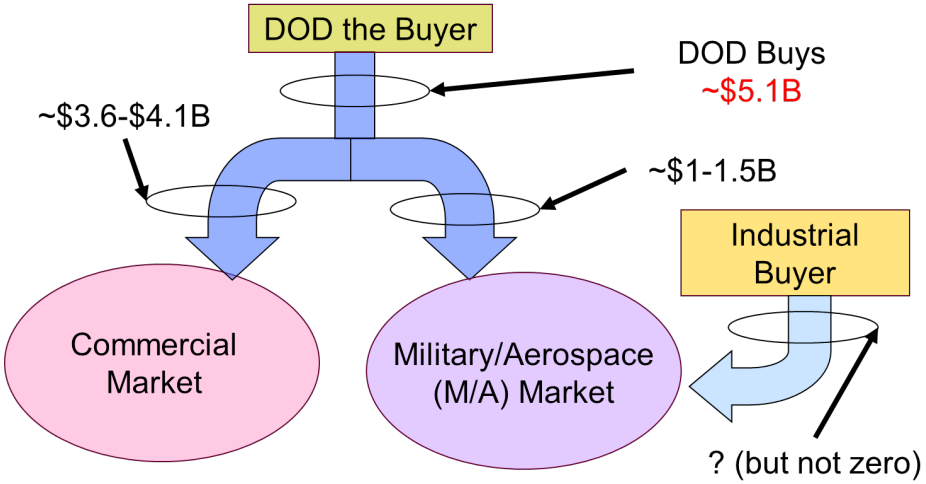
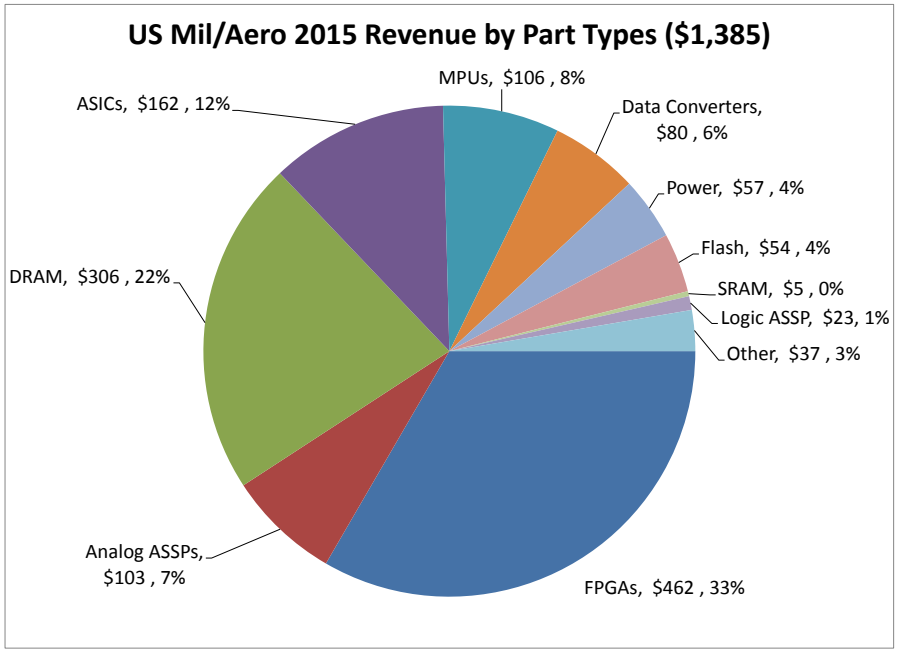
# DoD Market




Mil/Aero Mkt: $1-1.5B

Mil share =1.5/335*100 = 0.45%

Sources: [1] IDA Assessment and [2] dataBeans 2014, All data projected for 2015

Application Specific Standard Product (ASSP) - an integrated circuit (IC) dedicated to a specific application market and sold to more than one user. A type of IC with embedded programmable logic, combining digital, mixed-signal and analog products. When sold to a single user, such ICs are ASICs (Gartner)

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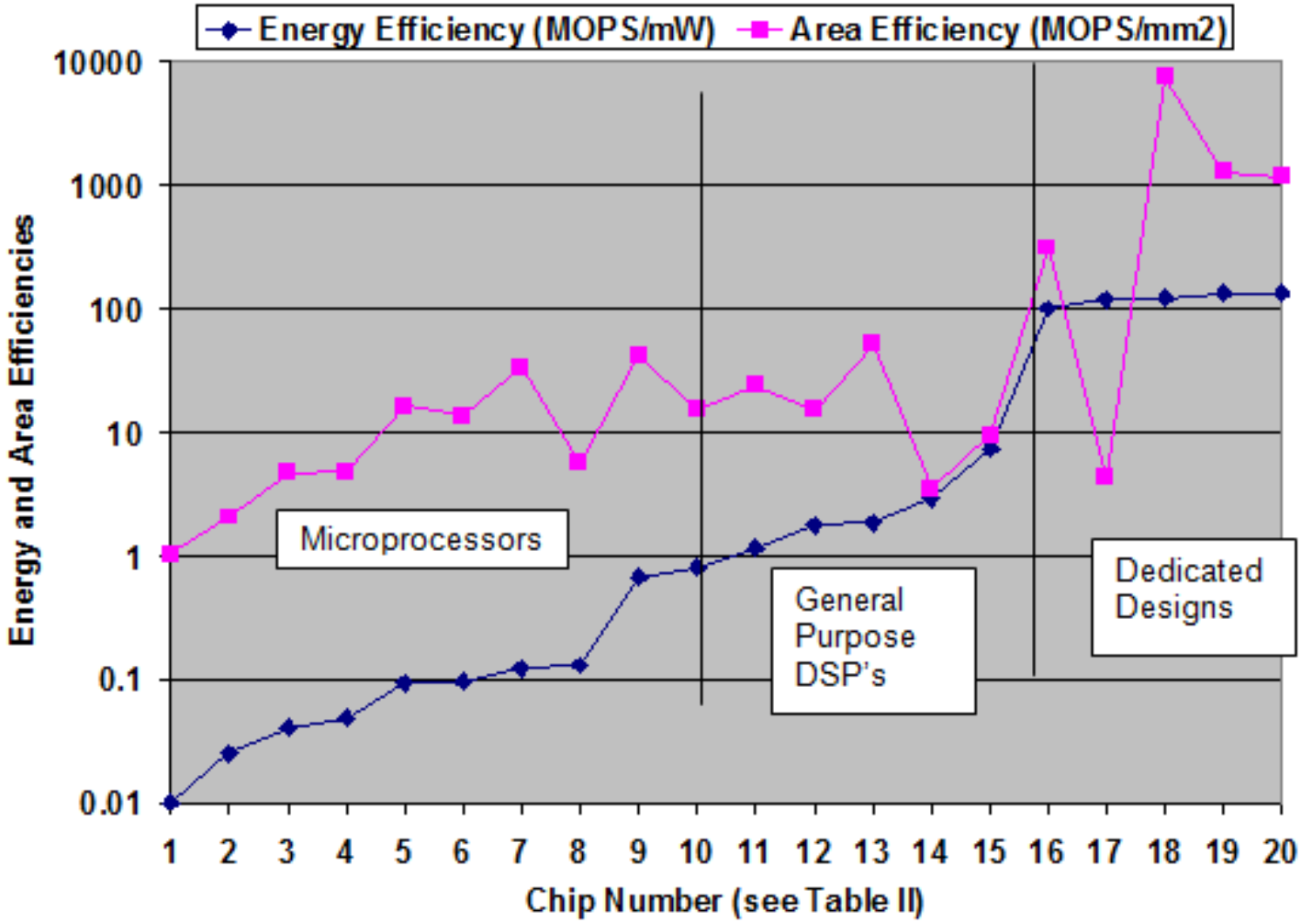
# Performance Considerations



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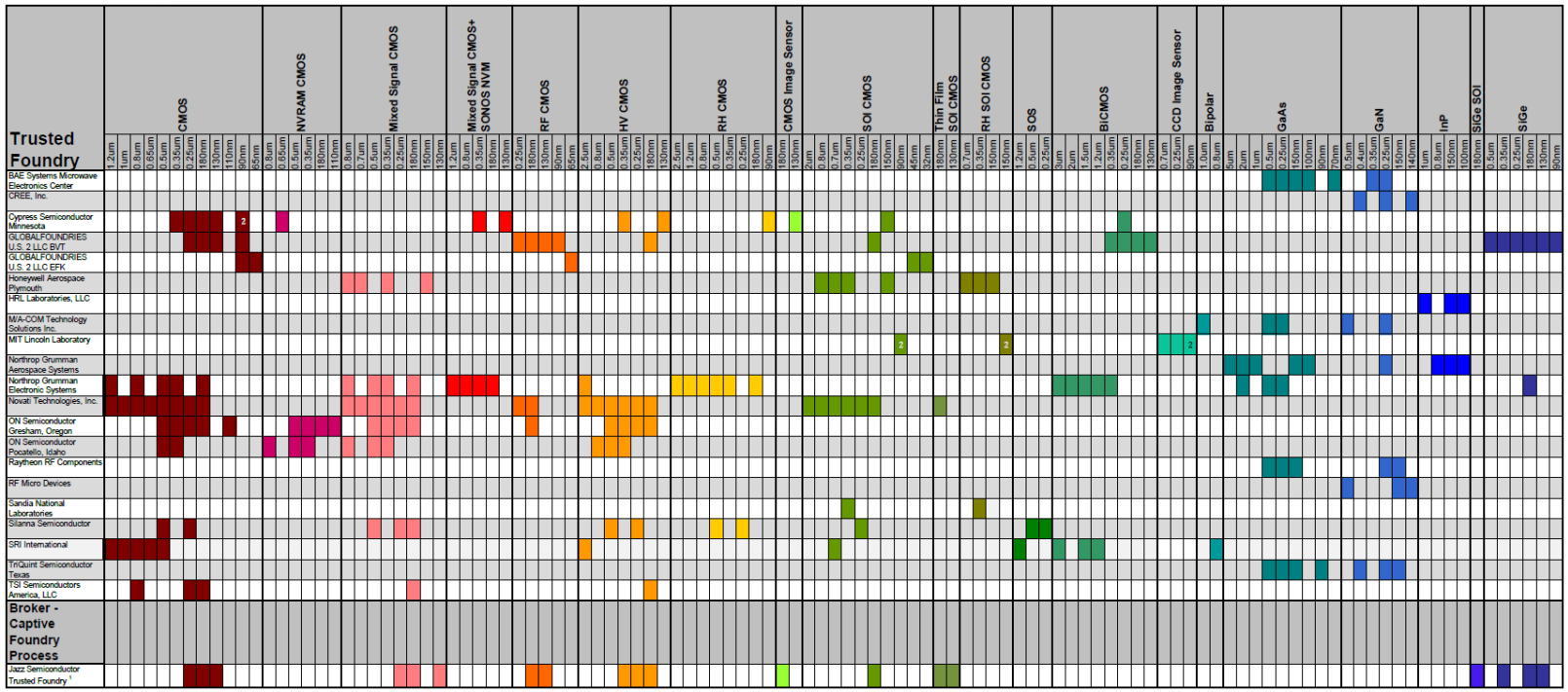
# Trusted Microelectronics Providers

## Trusted Integrated Circuit Supplier Fabrication Processes




[1] Cat 1B Captive Foundry process for Unclassified only

[2] Back End Metal is Aluminum

As of 12 April 2016

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# DoD Foundry Needs and Some Considerations

- **Based on observations of foundry usage**
- **Access to both 200mm and 300mm fab technologies for custom/semi-custom chips**
  - Specialty technologies, including legacy devices
  - Low power and high performance digital
  - RF/mmwave
  - IP
  - Full flow must be trusted (masks, designs, WIP, ASIC/foundry, etc.)
  - Specialty packaging
- **Considerations for <u>some</u> DoD end-uses**
  - DoDI 5200.44 policy for custom designed application-specific integrated circuits (ASICs) in covered systems (and protection from malicious insertions)
  - ITAR/EAR, weapon use considerations, or other military end-uses
  - Additional sensitivities of information in designs or related IP

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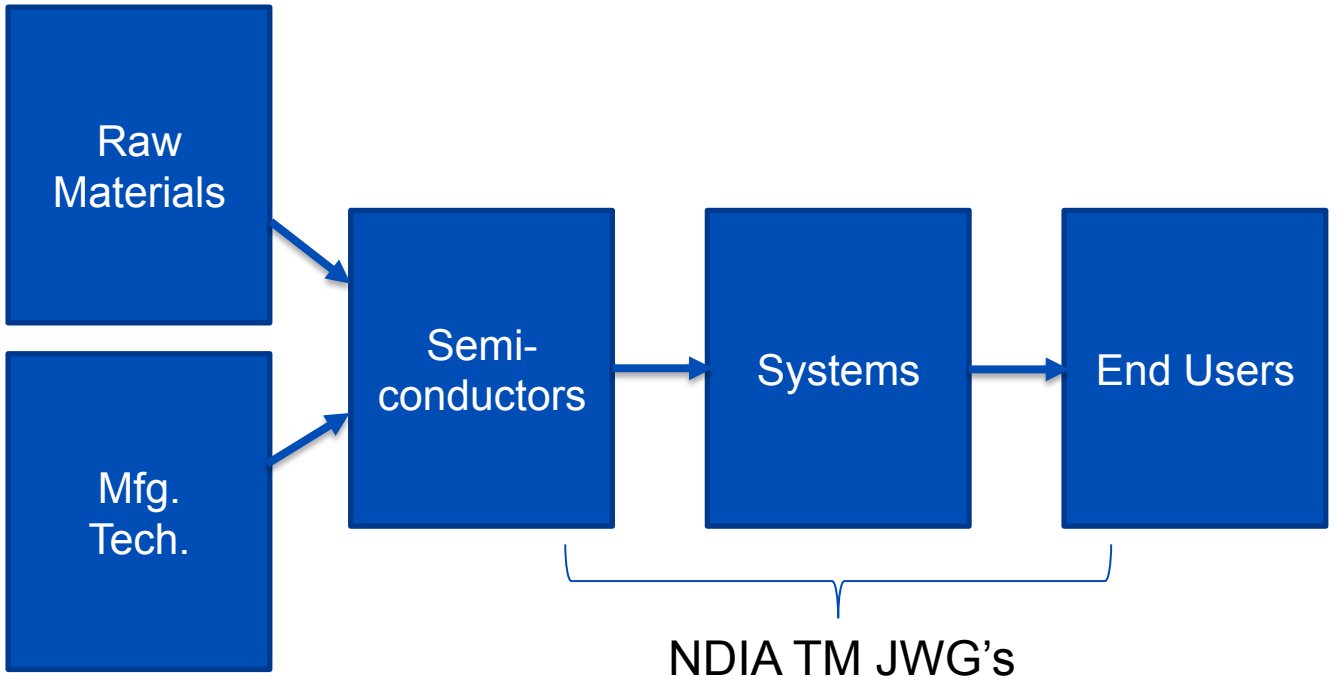
# Production Chain (greatly simplified)




- DoD often sponsors R&D at location of greatest impact for innovation and transition
- DoD programs are vehicles for acquisition of systems and technologies inside systems

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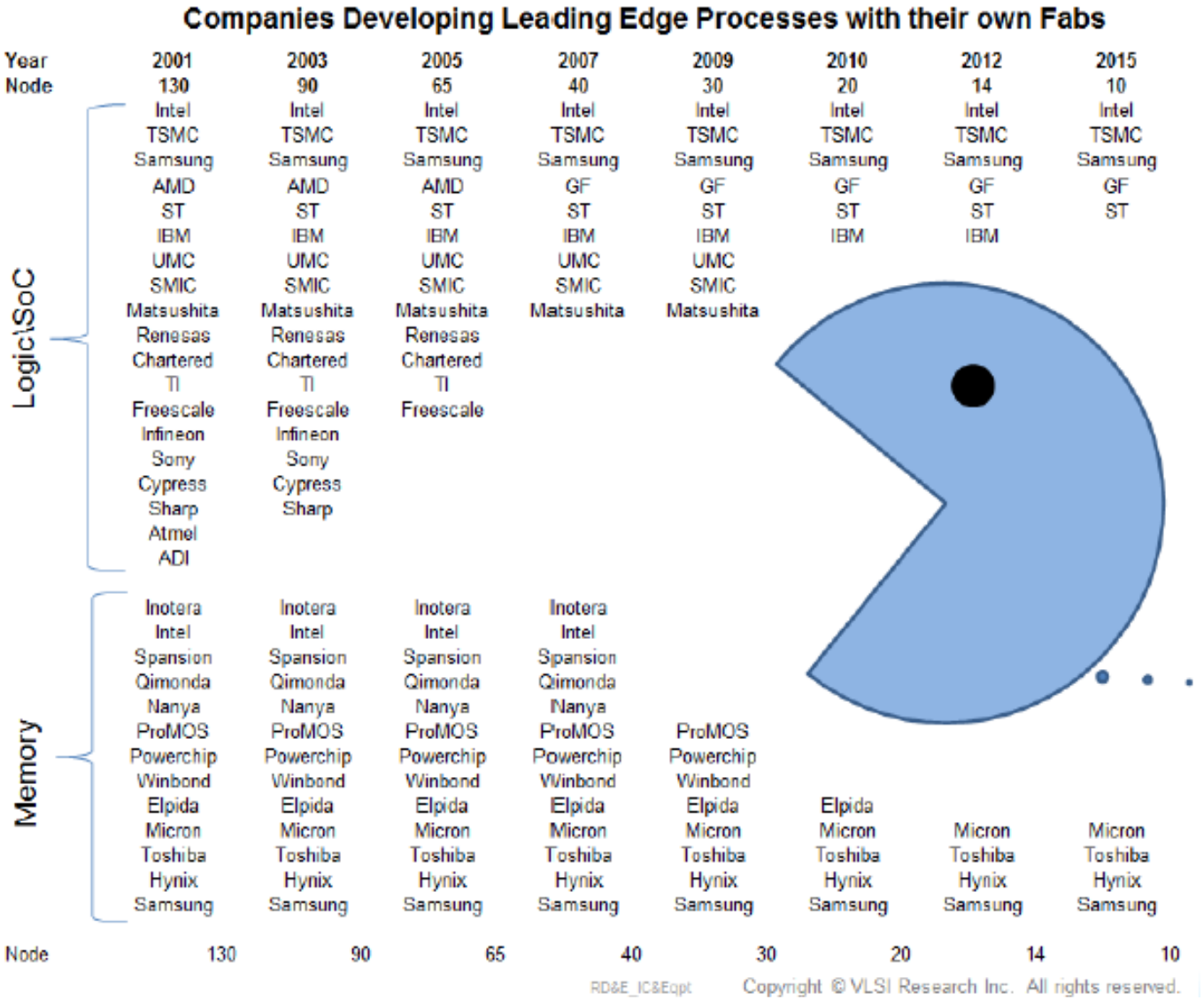
# Consolidation of Industrial Base




- Same Story in Equipment and Fabless Sectors
- Globalization
- Access to technologies

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# NDIA Trusted Microelectronics Joint Working Group Launched in May 2016

- **Developed in conjunction with participants from February NDIA Trusted Microelectronics Workshop**
- **Study teams formed to explore feasible solutions to defense systems microelectronics challenges**
  - Team 1: Determining future requirements . . . *what will be needed to maintain military technology advantages?*
  - Team 2: Maintaining access to required technologies . . . *how can we counter shifts in market dynamics that may impact supply?*
  - Team 3: Trustable microelectronics standard products. . . *how can we incorporate technologies and components from suppliers outside defense base?*
  - Team 4: New methods to instill trust in semiconductor fabrication . . . *where will the technology solutions be available?*

***Lots of Experience and Talent Focused on Core Issues***

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# NDIA Trusted Microelectronics Joint Working Group Teams: Leaders and Members

| Team | Topic | Members | Leader |
|---|---|---|---|
| 1 Red | Future requirements | 10 | Charley Adams<br>Northrop Grumman |
| 2 Green | Trustable leading edge technology access | 15 | Ezra Hall<br>GLOBALFOUNDRIES U.S. 2 |
| 3 Yellow | Trustable microelectronics standard products | 13 | Dan Campion<br>Honeywell |
| 4 Blue | New methods to instill trust in semiconductor fabrication | 19 | Pat Hays<br>Boeing |

***A Support & Integration Team Will Provide Assistance As Needed***

# NDIA Trusted Microelectronics Joint Working Group : Schedule

- **First report out: NDIA Trusted Microelectronics Workshop, today, Crystal City VA**
  - Team and topic introductions
- **Second report out: NDIA Trusted Microelectronics Workshop, February 2017, Washington DC area**
  - Preliminary findings
- **Final report: Trusted Accredited Supplier Industry Day at GOMACTech 2017, March 20th, Reno NV**
  - Findings and recommendations

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# Summary

- Need to think through new approaches and strategies for future Trusted access . . . *technology solutions as well as acquisition and policy adjustments*
- Options have been studied by government teams. . . *need input from industry in interactive discussions*
- NDIA Trusted Microelectronics Joint Working Group launched to address key issues . . . *combines perspectives of industry and government experts to develop inputs on most viable solutions*

***Level of Participation Has Been Encouraging and Appreciated***