PARTS OBsolescence Workshop:

Impact of Commercialization on Parts Obsolescence

22 April 1997
Redstone Arsenal

A Semiconductor Perspective on Obsolescence

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Market Perspective

Electronics

IC TAM

WW Military ICs

$1.1B

$1.9B

$1.2B

$3,000B

$300B

$1.1B

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IC Supplier’s View of Commercialization

**Includes**
- Standardization - Supplier’s P/N or Industry Standard SMD #
- Market Driven, Value Based Pricing
- Plastic & Ceramic
- Distribution Availability: Off-the-Shelf
- Electrical Performance, Quality and Reliability driven by intended market and application
- Various Temperature Ranges: Comm, Ind, Auto, Mil
- Allocation When Demand Exceeds Supply
- Market Driven Support Infrastructure
  - Application Support
  - Technical Data
- Obsolescence

**Does Not Include**
- Freedom from Parts Obsolescence
- P.O. with User P/N
- Spec review: General or Device
- Cost or Pricing/SF1411/SF1412
- Certifications
- FAR/DAR Regulation
- Rated Orders
- ADA Language Compilers/Tools
- ITAR Export Restrictions/License
- Classified Programs
- Change Control & data Retention
- Using Parts Beyond Data Sheet
- Access to Supplier Intellectual Property
- Warranty on Non-Recommended Uses
TI View of Perry Directive

• Perry did not say you must use Commercial Grade Parts.
• Perry did not say to use parts outside the manufacturer’s spec.
• Perry did not recommend “uprating” by inference from statistically invalid or inappropriate data obtained with the intent of circumventing the manufacturer’s spec.
• Perry did not recommend “upgrading” by third party test labs.
• Use performance based specs.
• Use Mil Specs & Standards when commercial doesn’t exist or doesn’t meet the total need.
### Some TI Facts

<table>
<thead>
<tr>
<th></th>
<th>1996 Actual EOL</th>
<th>1997 Est. EOL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Com</td>
<td>Mil</td>
</tr>
<tr>
<td>DSP/uP/uC</td>
<td>41</td>
<td>3</td>
</tr>
<tr>
<td>Logic</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Memory</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Analog/Mixed Signal</td>
<td>111</td>
<td>13</td>
</tr>
<tr>
<td>Total Catalog</td>
<td>170</td>
<td>24</td>
</tr>
<tr>
<td>ASIC</td>
<td>725</td>
<td>113</td>
</tr>
<tr>
<td>TI Total</td>
<td>895</td>
<td>137</td>
</tr>
</tbody>
</table>

- Fab conversions caused EOL on ASIC above 0.8 micron in 1996.
- Mil 64K & 256K memory discontinued in 96, commercial EOL 10 yrs ago.
- Many of Mil DSP/uP/uC projected for 97 EOL are sourced from die banks; commercial EOL occurred years ago.
- Commercial Notice is letter to direct customers buying within 2 years; 3 months order entry, 3 month delivery window.
- Military notice is registered letter to direct customers buying within 5 years, GIDEP, Web, order entry is 6 months, delivery typically 6 month but negotiable depending on situation.
- TI does not assume responsibility for notifying distribution customers.
Obsolescence Drivers

**WW SC Consumption**

<table>
<thead>
<tr>
<th>Year</th>
<th>$37B</th>
<th>$130.4B</th>
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<tbody>
<tr>
<td>1987</td>
<td>6%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>18%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>33%</td>
<td>54%</td>
</tr>
<tr>
<td></td>
<td>24%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>6%</td>
<td>4%</td>
</tr>
</tbody>
</table>

**Equipment Life Cycles**

<table>
<thead>
<tr>
<th>Market</th>
<th>Concept to Production</th>
<th>Produced</th>
<th>Product Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>3&lt;---6 Months</td>
<td>3&lt;---9</td>
<td>3 - 8 Years</td>
</tr>
<tr>
<td>Consumer</td>
<td>6&lt;---18 Months</td>
<td>3&lt;---12</td>
<td>3 - 8 Years</td>
</tr>
<tr>
<td>Automotive</td>
<td>2 - 3 Mod. Yr.</td>
<td>1</td>
<td>7 - 10 Years</td>
</tr>
<tr>
<td>Defense</td>
<td>3 - 8 Years</td>
<td>0 - 20+</td>
<td>&gt;20 Years</td>
</tr>
</tbody>
</table>

**Technology**

- Memory 4M - 16M - 64M
- ASIC #Gates / Feature Size
- Wafer Diameter
- Basic Process Volume
- Package

**Market Demand**

- Equipment Life Cycles
- Volume
- Speed / Functionality
- Value / Cost

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Recommended Alternatives

**Pure Commercial**
*Where It Meets Total Need*

**Pro’s**
- Broad Selection
- Lowest Initial Cost
- Q&R Adequate for intended market/application

**Con’s**
- More DMS plus little/no notice
- Nothing special
- No mfg support for out of spec use/screening
- Change info/data availability
- Technology Cost
  - ROM coded DSP = 5ku/12 mo
  - cDSP = $10M/24mo.
  - ASIC = $50M/24mo./5dsn
- Storage/Moisture Concerns
  - Tape/Reel = No bake
- EOL is not flexible!
- Surprise’s!
- No support for audit of Fab’s or A/T sites

**QML**
*Where Commercial Doesn’t Fit*

**Pro’s**
- Performance fully characterized/tested
- Environmental performance options
- DMS sensitivity
  - More notice
  - Some flexibility
  - Alternatives
- Support Infrastructure
  - Change information
  - Technical data
  - Applications Support
- Technology Access
  - ROM coded DSP = $30K NRE/500 units
  - cDSP = $5M revenue/life
  - ASIC = $500K/DSN/36 mo.
- Audit by DSCC/ISO/Others

**Con’s**
- Higher initial cost
- Less selection
- Less sources
Alternatives Not Recommended

Use Beyond Manufacturer’s Data Sheet

- No supplier can approve
  - Fundamental safety & liability issue
- User assumes full liability
- Supplier would testify against user if issue developed
- Dependent on electrical and environmental capabilities that can vary widely due to:
  - Wafer Fab
    - Owned, Joint Venture, Foundry
  - Assembly/Test Sites
    - Owned, Subcontracted
  - Equipment & Material Variations

Every part will undergo a fab move or wafer diameter change or electrical design change or shrink or package materials/process change or any combination within 3 years. Manufacturers only support data sheet and intended market requirements.

Upgrading/Uprating/Specials

- Upgrading always degrades reliability
- User owns process & results
- IC makers don’t share test program IP
- Commercial process stability; yield loss
  - Performance tweaks - no data sheet impact
  - Yield tweaks
  - Cost shrinks
    - Wafer diameter change
    - Die size shrinks
- Typical upgrade insertion causes 0.5% fallout for ESD/EOS plus unknown ESD walking wounded
- Burn-in = Don’t do it!
- Product capability balanced against market requirements and cost
- No vendor to vendor commonality in process or materials
- Who gets ITAR license?

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Things to Think About

- Some of the exact same parts some plastic proponents are citing as giving adequate or superior electrical performance without upgrading are shipped to the computer and distribution market with a single high temp (70 degrees C) test. These same parts must receive 100% high and low temp testing to pass automotive acceptance.

- Computer, consumer and much of the communications market are not concerned about performance beyond 0/70C nor moisture or temp cycle effects. They are obsessed with cost and performance related to data throughput. If an extra capability impacts cost it may disappear.

- 5V Technology has peaked, 3V here now, 2.5V and 1V coming! This will be serious future DMS problem.

- Who has good environmental capability data on 0.18 micron features?

- If today’s $1.2B converts totally to commercial by year 2002 it will represent less than 0.1% of WW IC TAM dollars/units. What influence or support will this drive?

- Will Military distributors exist if the TAM converts?

- Military & Aerospace users need to determine what other than low price they need and then proactively work with the QML suppliers to accomplish.
New QML Product Introductions

Key Introductions: 250 New Parts in Last 4 Years
- DSP - 320C80
- Logic - AHC Family
- Mixed Signal - 1394 Chipset
- Memory - 16M DRAM & SDRAM
(Note: A function is independent of the number of package or speed options)
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Conclusions/Recommendations

- DMS is not a ceramic vs plastic issue; it is an industry issue caused by the dynamics of the semiconductor market.

- QML parts will stay around longer
  - Selections have broad appeal ---> more volume - more life
  - More alternatives exist to extend life

- Make QML parts/suppliers your first choice.

- Use commercial plastic where it totally meets the need “as received”

- Don’t use parts beyond spec

- Give your process the “Wall Street Journal” test.