

Electronic Components for the Commercialization of Military and Space Systems

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The Future of COTS and QML in the 21st Century

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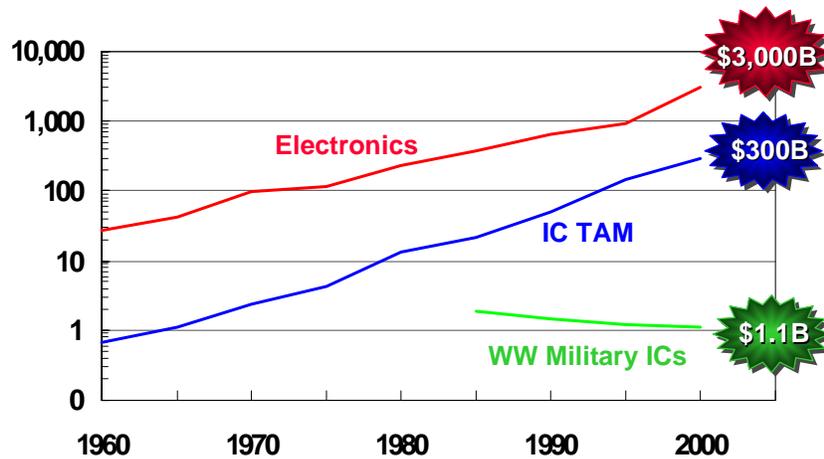
First of all, I want to acknowledge that the issues facing both the Military and Aerospace users and the IC manufacturers are difficult and perplexing. But nevertheless ones that must be addressed. I also recognize that there are differing views on how to address the issues; so here is one more!

First, understand that I did not come here to tell you that you cannot use commercial plastic parts. This is your decision. TI makes a wide selection of commercial IC's that work well in the intended applications.

But I do want you to understand that TI does not support your use of commercial plastic parts beyond their spec.

My goal today is to insure that your expectations when using commercial plastic parts are realistic and at the same time to address some of the myths associated with PEM's and their use.

Market Perspective



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One of the few things that I think we can all agree on is that the Electronics market will continue to grow for the foreseeable future and that growth is and will continued to be fueled by semiconductors and in particular by integrated circuits.

The WW IC market will cross \$200B before the year 2000 and will cross \$300B shortly thereafter!

This chart shows this dramatic growth. At the same time it shows the Military market declining from \$1.9B in 1985 to \$1.2B in 1995 with a flat to slightly down forecast.

Yes, the Military segment has declined but a billion dollar market is still a significant business opportunity.

The key message of this chart is that the Military market is not expected to disappear, but is becoming less significant to the major IC suppliers.

This says CHANGE will occur.

The Military and Aerospace
Customer's best hope for survival
is to appear as one virtual
customer to the IC makers.

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The key to the future is orderly change and standardization.

The Military and Aerospace customer's best hope for survival is to appear as one virtual billion dollar customer to the IC makers.

Today's QML methodology is the only process that I feel has a chance to keep you directly connected to the major's and successfully bridge to the future.

Perry Directive

- Perry Directive says
 - Use Performance Based Specs
 - Use Commercial Specs & Standards first
 - Use MIL Specs & Standards when Commercial doesn't exist or when commercial doesn't meet the total need.
- QML Products are Performance Based / Best Commercial Practice
- Perry did not say you must use Commercial parts.
- Perry did not say use parts outside the manufacturer's spec.
- Common sense dictates systems must meet Mission / User needs.

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There has been too much debate over what the Perry directive did or did not say and too little common sense analysis applied to how to move forward in an effective, efficient and orderly manner.

As an IC supplier the Perry directive tells me to use performance based specs as opposed to the old how to specs.

It says look for applicable commercial specs and standards that meet your needs before using unique Military specs and standards.

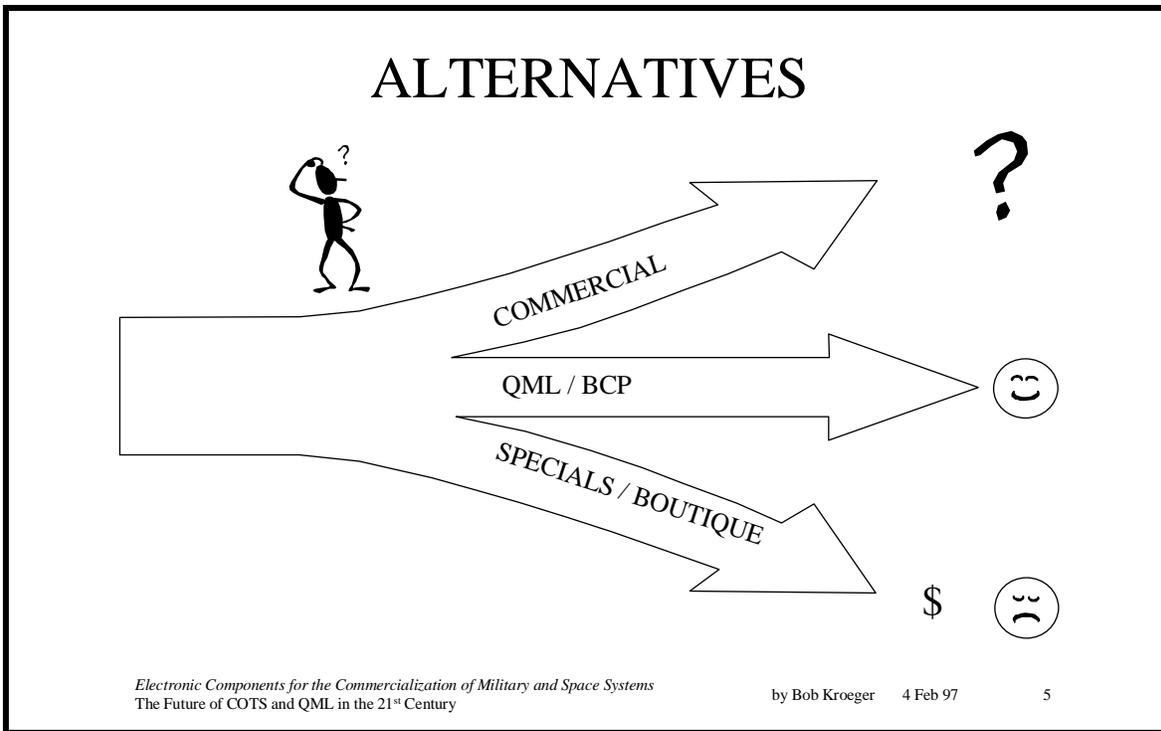
It says to use Military specs and standards where no commercial alternative exists.

QML components are performance based and can be used in any system without violating the Perry directive.

The Perry directive does not tell anyone they must use commercial parts.

The Perry directive absolutely does not say to use parts beyond the manufacturer's spec or in applications where either their long term reliability and performance are questionable.

Common sense dictates that military and aerospace systems must meet mission and user needs.



So what are the alternatives?

I think the industry needs to step back and determine what it really needs and can really live with. In other words, what is the desired state, and is that state obtainable? If its not, then who must change? Will the commercial market change to accommodate the Military and Aerospace user's needs? OR in light of the small number of units consumed by the Military and Aerospace market and the continuing commercial growth is it even realistic to think that without becoming the single \$1B virtual customer I described a moment ago will you survive?

I see three possible roads to the future.

Commercial, and I mean PURE commercial. Given the projected growth and today's problems in getting commercial attention, can you live with this and all its future implications?

The QML methodology which really incorporates Best Commercial Practice (BCP).

And the return to specials and the proliferation of Boutique shops.

Lets examine some of the bumps along each of these roads.

Commercial

Pro's

- + Lowest initial cost
- + Plastic = Less weight
- + Best selection
- + Reliability adequate for Commercial users

Con's

- More DMS issues & little / no notice
- Little / No Manufacturer attention / support; DISTY account
- No support for out of spec use - Disclaimers
- Nothing special - from commercial
- Few Hermetic offerings
- Change info difficult, no ability to impact

When I speak of commercial parts I mean pure commercial parts as that is all that will be available from the distributor through whom you buy the parts.

I agree that commercial plastic parts are the cheapest, most widely available and lightest weight. Their reliability is adequate for the commercial market they are intended for.

On the other side they have shorter life cycles and you WILL have dramatically more DMS issues to deal with.

This will be complicated by the fact that many commercial suppliers do not provide end of life notices and the fact that you will be dependent upon your distributor for notice.

Commercial operations have absolutely no interest in small volumes or such things as rated orders and the various certifications flowed down.

You should expect little or no manufacturer attention and application support

No reputable IC manufacturer will support the use of any part beyond the commercial data sheet.

This is a fundamental product safety and liability problem.

Many suppliers have already published disclaimers in their product literature and modified their terms of sale. I expect others will soon follow.

Change information may be available, but it will be difficult to obtain and it will be of an informational nature which you will not be able to influence.

You may get the info, but after the fact.

Commercial Myths

- PEM's solve the DMS issues!
- Performance beyond Commercial Spec will be there!
- One lot of PEM's Characteristics is like the next.
- All PEM's have the same Reliability.
- All PEM's from a given vendor have the same Reliability.
- OEM's will respond to my PEM problems.

While we are discussing commercial IC's I think some of the myths associated with them need to be addressed.

Not only will the number of DMS issues increase but the time for taking definitive action will decrease due to shorter build cycles of commercial operations and delayed or no notice situations.

Distribution is not the DMS solution because the IC manufacturer requires all sales of discontinued items to be final.

Its true that in many instances the same die is used for the commercial and military part. BUT, this is not always the case; sometimes different processes are used in the fab and on occasion even different mask sets are used.

If an IC manufacturer discontinues support for its military product family it is foolish to believe that the performance at temperature will remain. It will not! Within 3 to 5 years every device will undergo either a redesign, die shrink, process modification, wafer diameter increase or fab location change. When this happens, the game is over! The revised part will not even be characterized if the manufacturer is not in the military business.

Then there is always the question of maintenance of the process for extended temp capability; with no maintenance, expect problems! Because one lot performed at extended temperature is no assurance that the next will or that the lot purchased in the future will. Odds are that there will be a difference.

A lot of talk has been given to the improvements noted by the automotive industry; remember that 70% of the IC's consumed go into the computer and consumer segments and their needs are not necessarily the same!

To depend on anything beyond the manufacturer's data sheet (which does change periodically) is foolish.

Some PEMs advocates use reliability data obtained from 3 to 5 year old simple plastic DIP packages to validate using complex plastic surface mount package devices having greater than 300 pins; this is flawed logic.

The risk of moisture, thermal and temperature cycle problems grows as the number of pins increases and the spacing between them decreases.

Any PEM justification should be based on specific facts, not vague inference.

If your application is within the bounds of the dominant commercial market segment's initial and long-term environmental and electrical performance needs you are reasonably safe; otherwise you have a serious risk that you must address.

IC manufacturers will respond to real device problems. BUT if the part meets the published data sheet and expected environmental performance it may not be seen as a device problem and corrective action is unlikely.

QML / BCP

Pro's

- + Best Electrical Performance
- + Best Environmental Performance for given package
- + OEM support infrastructure
- + DMS sensitivity
- + Reasonable cost of ownership
- + Increasing interest among Mid-Range Suppliers
- + Hermetic or Plastic available

Con's

- Higher initial cost
- Less selection of Parts
- Less Suppliers

The electrical performance of a QML part is fully defined and not an issue.

The environmental capability is optimized for each type, whether plastic or ceramic.

Manufacturers offering QML parts have made the decision to provide the support infrastructure necessary to support the market.

QML suppliers are sensitive to the DMS issues and take special steps to insulate their customers.

When obsolescence is a necessity, notifications are made both directly and through GIDEP.

Order entry and delivery windows are made longer to help ease the problem to the customer.

QML suppliers tend to be more flexible in responding to their customer unique DMS problems and will do many things that a commercial plastic operation would not even consider.

Though changing, the QML supplier list is continuing to grow; there are now 23 suppliers with some 15 others giving the program careful consideration.

Your actions and attitude as a market and virtual customer can influence their decisions.

I will not argue that the initial cost of QML parts is lowest, but I do think a case can be made that QML parts offer a competitive total long-term cost of ownership for any application requiring performance beyond the commercial spec.

Specials / Boutique

Pro's

- + For the right price someone will do most anything

Con's

- Step backward in time
- Not a Commercial trend
- Don't expect IC Maker to support issues
- Few Boutique shops have ability to test Advanced Technology parts ---- Tester Cost ---- I.P. Issues.
- No Volume Base = High Cost

There is no doubt that for the right price some one will agree to do most anything.

No matter how you cut it, this is not commercialization and is not cost efficient.

Having evaluated many of these operations as potential subcontractors I can say with certainty that they are not equipped to test complex advanced functions either from a tester hardware or software view.

Major IC makers do not share or license the intellectual property that test programs represent.

Do not expect IC manufacturers to support issues that develop as a result of either direct or third party commercial die sales.

Wafer related reliability issues will be supported but the potential for contamination once the wafer changes hands is great and is typically the result of handling beyond the manufacturer.

As wafer diameters continue to increase the cost of this approach will increase exponentially!

Recommendations

- Standardization = QML / BCP = Virtual Customer = Success
- Use QML Parts as first choice
- Use PEM's only where they completely meet system need.
 - Consider replaceable or Limited Life approaches
 - Anticipate 3 to 5 year parts Life
- Reward Suppliers that support total needs
- Forget Initial Cost, Think Total Cost of Ownership
- Forget Cost, Think Price
- Excess Capacity Temporary!

Speaking not simply for Texas Instruments, but as one familiar with both the commercial and military markets my recommendations are as follows:

Standardization = QML/BCP = one virtual customer = survival!

Make QML parts your first choice.

Use PEMs only where they completely meet the system need.

Reward suppliers that support your total needs with your orders.

Think about total long-term cost; forget about initial cost.

Don't confuse the market price available to large commercial users with the price you will pay for small volumes.

Remember, today's excess IC capacity will disappear and shortages will reappear.