

# Hybrid QML Update

Issue 9

June 2000

## Hybrid Manufacturers: A Key to Resolving Some Obsolescence Issues

The Diminishing Manufacturing Sources and Materials Supply (DMSMS) Teaming Group consists of the Military Services Representatives, DOD Civilian Personnel and the Original Equipment Manufacturers (OEM's). The team is chartered by the OSD to identify DMSMS teaming opportunities and to provide feedback and communication between the Services, DOD Support Organizations and the OEM's. The information exchange enhances the DOD's ability to support production and sustainment life cycle modes of the weapon system platforms.

The next DMSMS Teaming Group meeting will be hosted by the Defense Supply Center Columbus (DSCC) **July 11-13, 2000**. The DMSMS Teaming Group has requested information on hybrid manufactures listed in MIL-PRF-38534. **Any hybrid manufacturer interested in providing information or giving a presentation on their companies capabilities should contact: Mr. Chet Lewis.** ( DSCC-VSC ) Phone (614)-692-0653 or email [Boyd\\_Lewis@dsccl.dla.mil](mailto:Boyd_Lewis@dsccl.dla.mil)

## You Can Implement Acquisition Reform by Buying QML Hybrids!

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A big buzzword in the military industry is "Acquisition Reform." I recently completed an on-line course on acquisition reform. The course emphasized the following:

1. **Embrace effective supplier relationships as a core business strategy and build organizational structures with skilled people to carry out the strategy.**
2. **Use a rigorous supplier selection process to create a strong supplier base that you can more effectively manage.**
3. **Establish effective communications and feedback systems with suppliers to continually assess and improve both your own and your supplier performance.**
4. **Foster an environment in which suppliers realize that more significant contributions are matched with significant rewards.**

The course is based on a study of commercial businesses and how they do their procurement. The above practices are the summation of what was found to be effective in the commercial arena. Many of the processes described are also elements of the QML process. *"The companies selected suppliers using specific assessment methods, such as certifications and quality audits that identified the total cost of doing business, not just the sales price of the supplied product."*<sup>1</sup>

The course cited case studies where military system offices have tried the approaches above and compared them to offices that used more traditional approaches. Although the systems built using the new philosophy have not completed the whole procurement process, the impacts of the changes appear very positive.

How can the QML contribute to your efforts to implement some of these principles?

First of all, the qualifying activity (DSCC-V) acts as an extension of your procurement team. We have the technical expertise to evaluate the supplier's quality system, processes, materials, and testing (i.e., product performance). We additionally have the data on hand to support the reliability level of the manufacturer processes/materials. We maintain these relationships on an on-going basis by performing audits every one to five years, reviewing the manufactures self-audits and periodic testing results at least annually, and reviewing the manufacturer's major changes as they occur. Note: Audit reports are written for every audit and can be obtained by contacting the manufacturer.

Second, DSCC-V prepares the standards for procurement (i.e., MIL-PRF-38534 for Hybrid Microcircuits) and will even prepare and manage your part specific drawings (Standard Microcircuit Drawings (SMD)).

New technologies are important to you. Capturing them in our standards supports the QML. We take two approaches in addressing new technologies. One is to allow flexibility in the specification for alternate testing and criteria. The other is to pursue information on these new technologies and to add guidelines to the MIL-PRF-38534 to address them.

But, you may say, "we don't always need the Class H or K, high reliability levels for our applications."

Great! Acquisition reform encourages using products that meet the application, not always buying the top parts. MIL-PRF-38534 has been changed to address this issue. You can have us specify in your SMD, or you can specify in your Source Control Drawing (SCD), the level you need. **We challenge you to find any product you need that cannot be bought to one of the following levels.** Note: All class levels must be built in a facility certified by DSCC which indicates that they have a qualification and quality system that satisfies MIL-PRF-38534, and must be listed on QML-38534 indicating they have data to support the performance of the product to the appropriate level. The quality system meets and exceeds the requirements of ISO 9001. Processes must be controlled to ensure consistent product performance and outgoing product quality is a major factor in the QML program.

- **Class D:** Use this Class level when you need to customize the product quality, when a manufacturer offers a product with their own quality level that is acceptable to your application, or when the technology involved has not traditionally been characterized by MIL-PRF-38534. This level has a manufacturer-defined level of testing.
- **Class G:** Use this level when you need proven technology and products, but can afford some risk. These parts are qualified (one time testing of processes and materials) to the same level as H and K. They are also tested 100% environmentally and electrically so that you know they should be working when you get them. However, sample testing on incoming components (to reduce rework and delays in production due to unacceptable materials), and periodic testing (used to assured the continued robustness of certain processes/materials) are not necessarily performed. The manufacturer does however, guarantee the process/materials continue to be robust.
- **Class H:** Use this level when your product must survive in a rugged environment and your tolerance for failures is very low. These processes and materials are qualified to the highest level. They are 100% tested environmentally and electrically to ensure they are working when shipped. Additionally, incoming sample testing is performed on incoming components to ensure their suitability for production, and periodic testing is performed throughout production or end-of-line to assure the continued robustness of the processes/materials/design.
- **Class K:** Use this level if you need highly reliable products for Space and unmanned critical applications. This level has all the controls of Class H plus additional periodic and incoming inspection testing to further reduce risk.
- **Class E:** Use this level when you want something close to G, H or K, but want to specify certain exceptions to performance, testing, etc.

You might ask "What about non-hermetic parts?"

Non-hermetic parts can currently be bought under Class Levels D or E. However, efforts are underway to add a non-hermetic appendix to MIL-PRF-38534. Class levels will be defined by the specific non-hermetic technology. The current plan includes identifying the performance expected for each technology in relation to the environment. We are currently conducting a survey to aggregate information on these technologies. If you are currently producing or buying non-hermetic technologies please go to our web-site and complete a survey. [www.dsccl.com/downloads/VQGeneral/NonHsurvey.pdf](http://www.dsccl.com/downloads/VQGeneral/NonHsurvey.pdf)

Browse our web site or call us to find out more about having SMDs written, how to specify QML in your SCD, how to chose the right class level, how to find QML suppliers, what audits have been performed and their status, and anything else you want to ask.

<sup>1</sup> Managing Suppliers (Integrating Commercial Practices with Government Business Practices)

## Inside This Issue...

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This Hybrid QML Update is an unofficial publication produced by DSCC-VQH to keep users and manufacturers informed on issues concerning Hybrid and MCM microcircuits. The articles contained herein are for information only and do not represent official Defense Logistics Agency (DLA) policy. We invite comments and feedback concerning the topics presented in this issue and suggested topics and articles for future issues. Contact us at DSCC-VQH, PO Box 3990, Columbus, OH 43216-5000, or [http://www.dsccl.com/offices/sourcing\\_and\\_qualification](http://www.dsccl.com/offices/sourcing_and_qualification), or 614-692-0663.

## What is Commercial?

Joe Buben, DSCC-VQH  
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### The search...

I decided to do a little web surfing and found a number of interesting sites when I typed "commercial" in the Yahoo® search engine. When I went to the web pages, I found that companies made industrial/commercial grade product as well as lower grade consumer items. The types of commodities included: Headsets, audio and radio equipment, blenders, kitchen appliances, miniature lights, playground equipment, some really serious bug killers (the insect-o-cutors ®), restaurant equipment, trash bag liners, grass trimmers, vacuums, carpet, shelving, fencing, rock tumblers, chemicals, decking, plumbing, tile, toilets, jerky, castor oil, gym equipment, antenna towers, windows, faucets, and telephones. Most of the product was standard but some offered custom product to suit the users' needs.



### Is it a grade?

Commercial was used to describe the heavy-duty grade. It was often used in conjunction with professional and industrial (e.g. commercial grade professional telephones). In addition to commercial, some of the other grades that were offered included: Industrial, residential, consumer, medical, contractor, professional, extended, export, home, residential, premium, weapon, and engineering. Castor oil had some interesting ones which included commercial, first special (which seemed like it was better than commercial), pale pressed, and medicinal.

### Where is it used?

Commercial was also used to define where the product was used such as schools, churches, or public buildings. Home and consumer uses were usually excluded.

### What does it mean?

I found 13 different grades for over 28 commodities, where "commercial" was usually the top grade. "Commercial" also meant that it was used in schools, churches and public buildings. These places probably have service requirements that are tougher than home use. Although I see signs of change, a lot of people in the electronic components arena still seem to believe the term "commercial" means the cheap stuff that you can buy at your corner electronics shop or liquidation outlet. That is **just the opposite of most commodities**. The typical consumer doesn't even have access to most "commercial grade" items.

### What I really meant to say...

The push to use commercial parts in the military does not mean use the lowest quality stuff in your toughest application. It was intended to drive use toward readily available items and to avoid special orders. You still have to consider operating conditions and the quality level of the parts! We have had manufacturers tell us that some customers are so bent on making sure they get a "commercial" part, the company takes its standard off the shelf QML parts and specially marks them to accommodate that customers special commercial marking requirements. Go figure.

### QML parts are readily available.

Using performance requirements, QML manufacturers make high quality standard parts that are readily available. And like other customer focussed commercial manufacturers, many can also make custom devices for truly unique applications. So the next time you hear the term "commercial", think of this as "readily available" and consider the application.

## Registered Users of a SMD get a personal Invitation to comment on Proposed Changes

Mike Jones, DSCC-VAS  
614-692-0512

One of the main cornerstones to the Standard Microcircuit Drawing (SMD) program is the coordination and document control aspects. The main avenue for this procedure is the Registered Users Database. This is a listing of device users and SMDs being used, and is the main method of coordination with the users of these devices. When an SMD is revised one of the first steps is to check the registered users. DSCC contacts each of the equipment manufacturers listed for the SMD in question and verifies that the proposed change will not negatively impact their system. If it does, than an alternative must be found. If the registered users system is to work, all users must register. This can be done by simply faxing, mailing or E-mailing the list of SMDs being used as well as the point of contact information (name, address, phone number, E-mail) and the system it is being used on to Joe Kerby (614-692-0544, fax: 614-692-6939 or email [Joseph.Kerby@dsc.dla.mil](mailto:Joseph.Kerby@dsc.dla.mil)). DSCC then inputs this information into the database and the equipment manufacturer will begin getting coordination information before the changes are made.

This is a vital step in the SMD process and all equipment manufacturers are encouraged to register with DSCC.

[Michael.Jones@dsc.dla.mil](mailto:Michael.Jones@dsc.dla.mil)

## MIL-PRF-38534 Update

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Revision D of MIL-PRF-38534 was dated on the 6<sup>th</sup> of January 1999. This is over a year ago, so it is probably time to begin work on revision E. Due to feedback from the industry, for convenience of use, a revision will be done rather than an amendment. This will allow the document to remain as a single cohesive unit, rather than having replacement pages. In any case, DSCC currently has a number of issues which will be addressed in the next revision. These issues include:

- The performance of SEM analysis on discrete devices used in hybrids.
- The performance of PIND in Group B for Class K is redundant with screening.
- The analysis of the failure when using the 5(1) option for Internal Water Vapor.
- For class K devices incoming on die should be waived only when MIL-PRF-38535 Class V die is used (similar to the allowance for JANKC die).

A draft of this revision should be available from DSCC-VA shortly. If you have any comments or suggestions to make feel free to contact Mike Jones at 614-692-0512 or [Michael.Jones@dsc.dla.mil](mailto:Michael.Jones@dsc.dla.mil).

## WEB Page Update

### Computer Corner



At first glance, it would appear that little has changed in recent months on the Hybrid Devices Team area of the DSCC Sourcing and Qualification Unit (DSCC-VQ) web pages. However, much of the information is now stored in a database and this means that real-time or near real-time (in some cases) information is available to you. You will be able to find the same types of information in the same places, as in the past; however, you will generally find that much of the content has been updated.

As always, the Hybrid Devices Team can be found at [http://www.dscccols.com/offices/sourcing\\_and\\_qualification/offices.asp?section=VQH](http://www.dscccols.com/offices/sourcing_and_qualification/offices.asp?section=VQH). Within our pages you will still find the following information:

- Anticipated audits for the next 90 day period: [http://www.dscccols.com/offices/sourcing\\_and\\_qualification/Audit.asp?Section=VQH](http://www.dscccols.com/offices/sourcing_and_qualification/Audit.asp?Section=VQH)
- The entire list of reports, forms, and program information that pertains to the Hybrid Devices Team: [http://www.dscccols.com/offices/sourcing\\_and\\_qualification/Resource.asp?SectionID=VQH](http://www.dscccols.com/offices/sourcing_and_qualification/Resource.asp?SectionID=VQH)
- A list of associates who can answer your questions about the hybrid microcircuit program can be found at [http://www.dscccols.com/offices/sourcing\\_and\\_qualification/offices.asp?DiscID=hybrid&Section=VQH](http://www.dscccols.com/offices/sourcing_and_qualification/offices.asp?DiscID=hybrid&Section=VQH)
- The current issue and previous issues of QML-38534 are located at <http://www.dscccols.com/programs/qmlqpl/QPLdetail.asp?qpl=38534>
- The on-line real-time part search for QML-38534 is available at <http://www.dscccols.com/programs/psearch/38534.asp?mode=Search>
- Finally, company/plant information for each QML-38534-listed supplier is located at <http://www.dscccols.com/programs/psearch/38534.asp?mode=CompanyList>

Of course, you may certainly browse around the rest of the Sourcing and Qualification Unit web pages and the rest of the DSCC web site. You will find a wealth of information.

If you have any questions about the Sourcing and Qualification Unit pages, please contact Ned Raybould ([Edward\\_Raybould@dsc.dla.mil](mailto:Edward_Raybould@dsc.dla.mil), (614) 692-0582), or Rick Barker ([Richard\\_Barker@dsc.dla.mil](mailto:Richard_Barker@dsc.dla.mil), (614) 692-0596).

## Call For Newsletter Articles



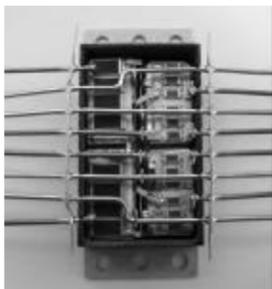
We welcome input from the industry that could be included in future editions of the Hybrid QML Update. If your organization has any activities that are of interest to the hybrid/MCM community, we encourage you to submit material on each subject and extend our thanks to those who have contributed. Please send your articles to your DSCC-VQH contact or Jackie Cunningham ([jacqueline\\_cunningham@dsc.dla.mil](mailto:jacqueline_cunningham@dsc.dla.mil)) at 614-692-0584 or Brad Deslich ([bradley\\_deslich@dsc.dla.mil](mailto:bradley_deslich@dsc.dla.mil)) at 614-692-0593.

# Company Profiles



## ▼ SENSITRON SEMICONDUCTOR

### Sensitron Granted QML Listing



Sen-1980 Module

Two MOSFET power modules have been used by Sensitron Semiconductor to gain a listing on QML-38534. The SEN-1980 being an H-bridge MOSFET module, whereas the SEN-2842-1 is a half-bridge MOSFET module. Both are suited for versatile power supply applications.

The SEN-1980 is representative of a typical product from Sensitron's power module line. This type of power hybrid utilizes copper base technology to achieve extremely low thermal resistance from junction to case, while maintaining a high level of reliability. Multilayer soldering techniques incorporating ceramic substrates and metal layers, both with high thermal conductivity are applied to accommodate thermally mismatched silicon chips to a copper base. Moreover, each of the four IRFC450 MOSFET chips is first encased into a hermetic surface mount package (SHD-5) with aluminum wire bonds, which are high temperature solder-attached and sealed. They are fully screened prior to the module's assembly. Resistor and capacitor snubber circuits, as well as MOSFET gate resistors are also incorporated to achieve a higher level of integration. These components are attached to MOSFET packages through interconnecting terminals by a step-soldering technique. The entire assembly is conformally coated with an RTV compound, then potted with a high strength epoxy to ensure mechanical ruggedness. The finished module, excluding leads, measures 1.9" long x 0.92" wide x 0.405" high.

The SEN-2842-1 uses an industry standard metal package—MO-079. Two IRFC460 MOSFET chips and four MURC860 fast recovery rectifier chips are solder-attached to two aluminum nitride substrates, which are copper metallized by active brazing. These substrates are solder-attached to the package base in the same step as die attachment; MOSFET gate zeners and gate resistors are epoxy-attached. Aluminum wedge bonding is applied to connect both MOSFETs and rectifiers, whereas zeners and resistors are connected by gold ball bonding. All components are conformally coated prior to hermetic sealing. The conformal coating is expected to provide extra electrical isolation between the components and the metal package.

Through the development of these two products, Sensitron has successfully demonstrated its materials and process capabilities under the current issue of the Performance Specification MIL-PRF-38534, Hybrid Microcircuits, FSC 5962. As a result, Sensitron has been granted qualification. Sensitron is QML listed as Class H for their hermetic, surface mount diode and transistor packs (components of the modules) and Class E for the modules. However, the class level of the module may be changed. See the next article.

#### What Class Level Will Apply to this Unusual Technology?

Sensitron's power module is one of the uncommon technologies listed on QML-38534. Traditionally all technologies had to meet the requirements for design (e.g., hermetic, metal or ceramic packages) and all testing (RGA, bond pull, centrifuge etc.). Then "alternate testing" came along. This allowed different ways to prove out the robustness of the construction such as die attach and wire bond integrity. Now, with the several class levels available in hybrids, and with the "performance spec" approach, even design guidelines may be set aside if the performance and reliability can be proven.

Sensitron's power module is the first non-hermetic part to be qualified. But is it really non-hermetic? Hermetic seals protect the active components (bare die) and wirebonds. However, passive surface mount components (resistors and capacitors) attached to substrates are not hermetically encapsulated. Instead they are conformal coated and potted. Most of the concerns with hermeticity relate to the bare die and wirebonds.

At the January JEDEC/G-12 meeting, military customers stated that they wanted non-hermetic parts to have a unique class level. A task group of JEDEC JC-13.5 is working with DSCC to propose baseline test flows for non-hermetic technologies. DSCC is working on a proposal on how to identify non-hermetic devices. The outcome of these activities will impact which class level will be applied to Sensitron's power module as well as to other technologies.

If you have comments on how non-hermetic parts should be identified please send your comments to Jackie Cunningham (see back page). If you are currently buying or producing non-hermetic products please go to our web site and complete the Non-hermetic technology survey. This information will be helpful in formulating baseline testing for non-hermetic technologies.

## Microsemi PPC, Inc

Microsemi PPC, Inc., (formerly PPC Products Corp.) is a subsidiary of Microsemi Corporation, supplying transistors and rectifiers to the commercial, military and space markets. The primary products range from small signal to high power in most packages.

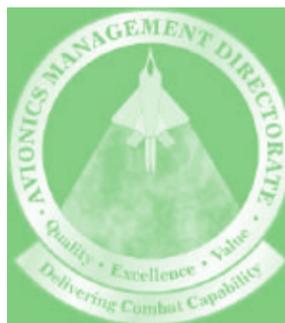
Microsemi PPC currently offers:

- 69 JANS power rectifier and transistor qualifications
- 83 JAN, JANTX and JANTXV Power Transistor - Rectifier Qualifications
- High voltage super-fast power rectifiers
- Aerospace, commercial, hi-rel, industrial and military products.

Microsemi PPC is an ISO 9001 registered company and has successfully merged their commercial and military assembly lines. This ensures that best practices (from both the commercial and military production) are applied consistently to all production regardless of the final application. The products are then subjected to the inspection and test flows for the various class levels.

Microsemi PPC recently achieved MIL-PRF-38534 Hybrid Microcircuit certification and qualification through the Defense Supply Center in Columbus, Ohio and plans to offer high reliability microcircuits through this program. Microsemi PPC's Qualified Manufacturers Listing (QML) can be viewed on the web at <http://www.dsccols.com/programs/qmlqpl/>.

## WR-ALC/LYP HYBRID FACILITY



Warner Robins Air Logistic Center/Avionics Management Directorate (WR-ALC/LYP) Hybrid Facility is an US Air Force manufacturing facility located at Robins Air Force Base, Georgia. This 2500 square foot Class 10,000 cleanroom facility is the result of a project started in 1985 to study the feasibility of repairing obsolete hybrid microcircuits. WR-ALC/LYP Hybrid Facility began its first reverse engineering project in 1988 during which 100 devices were assembled, tested, and delivered for use on the KC135 aircraft. In 1990, thick film substrate manufacturing capability was added including an active trim process utilizing a YAG laser.

WR-ALC/LYP Hybrid Facility capabilities include reverse engineering, circuit simulation, breadboard design, circuit layouts, thermal analysis, hybrid prototyping, level 2/level 3 documentation development, and hybrid circuit manufacturing. WR-ALC/LYP Hybrid Facility works with analog, digital, and mixed signal designs. Thick film capabilities include through-hole substrate printing, multilayer circuits, resistor on ceramic, resistor on dielectric, and custom resistor chips.

The mission statement for the Hybrid Facility is to provide stop gap relief to aging systems that suffer from obsolescence and/or diminishing sources. The focus is not on competition with private industry, but on providing solutions to the problems that are not economical for private companies to address. These are normally cases where there is very little data and the government needs a small quantity of devices.

In recent years, WR-ALC/LYP Hybrid Facility has provided prototype and development services to support obsolescence solutions from other companies (Hughes Aircraft, Ball Aerospace Engineering, and Defense Microelectronic Activity (DMEA)). While joint efforts with private industry have been beneficial for both parties, the DoD customer must provide funding to each party individually. For more information contact Jimmy Beeland at (912) 926-2688.

# Contacts

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