# Hybrid QML Update

**Issue 11** **August 2001**

## ISO 9001:2000 and How It Affects You

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**Introduction**

DSCC auditors have learned about the changes made to the quality management systems requirements (QMS) standard ISO 9001-2000 when compared with 1994 versions of ISO 9001 and ISO 9002. All QMS auditors are updating their audit criteria as auditees redevelop their QMSs to claim conformity to the new standard over the next three years.

These gradual changes promise benefits to the customers served by DSCC. Benefits include: more effective quality management systems to control more capable processes to deliver more conforming products and to improve levels of service from our customers' suppliers. The standard's new requirements should yield benefits which are discussed below.

**Improved system requirements**

The chief executive must become more involved as the standard specifies leadership requirements for top managers to provide visible evidence of their commitment.

The new standard emphasizes process control instead of documented procedures as companies are encouraged to design their processes for realizing the product. At least they are required to establish the necessary controls before monitoring and correcting their processes as necessary to result in conforming product.

Systems conforming to ISO 9001-2000 must be driven by measurable objectives and the results of surveys to measure customer satisfaction. Objectives are to be reviewed and changed as necessary to drive continual improvements in system, process, product and customer satisfaction within the specified requirements.

Most products comprise goods and services. Sometimes the customer specifies the goods required but not the services that form part of the product. Services must now be designed under ISO 9001-2000 even when the customer supplies the design for the "goods" or the tangible part of the overall product.

ISO 9002 can no longer be used to avoid audit of the design process for converting customer needs in product specifications. Outsourced processes cannot escape attention as the new standard also requires evidence of their effective control.

**Examples of new evidence expected by system auditors**

System auditors base their reports on verifiable evidence. Evidence of nonconformity or a lack of evidence of conformity with the audit criteria usually invokes action to improve the system to prevent recurrence of the nonconformity. The new evidence that will be sought by system auditors includes:

1. The sequence and interaction of the process essential to the system.
2. The scope of the system in the quality manual with justification for the system not addressing any part of the product realization requirements.
3. Changes to controlled documents.
4. Customer requirements explained for awareness by the employees.
5. Measurable quality objectives at each function and level.
6. A plan preventing any loss of system integrity when updating the system to conform to ISO 9001-2000.
7. Employees aware of the performance of their quality management system.
8. Resources for improvement and for assuring customer satisfaction.
9. Records showing employee qualifications, education and experience.
10. Contractor design of the product where the design is incomplete.
11. Records of design validation showing how well the prototypes (that conform to verified designs) meet user requirements.
12. Records of the effects of design changes on product already delivered.
13. Criteria for evaluating and re-evaluating suppliers.
14. Conformity to procedures as further evidence of management commitment.
15. Special processes re-validated for their ability to produce conforming product.
16. Previous audit results influencing planning of subsequent internal audits.
17. Identity of the person responsible for each product release.
18. Records of actions on nonconforming products after delivery or use.
19. Data analyzed for continual improvement (not just for preventive action).

**Conclusion**

ISO 9001-2000 is more demanding of organizations, companies and of auditors but the changes should result in more effective quality management systems. With effective updating of quality management systems and rigorous auditing, we can reasonably be assured that more products from systems that conform to ISO 9001-2000 will satisfy customer requirements.

*Editor's note: As DSCC-VQ continues to offer ISO 9000 registration to its QML/ QPL companies as a value-added service, we felt it appropriate to include the above article concerning changes to ISO 9001 requirements and are grateful to its contributor. DSCC has published guidelines for its DSCC ISO registered manufacturers on the transition from ISO 9001:1994 to ISO 9001:2000.*

## Inside This Issue...



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.dscccols.com/offices/VQ, or 614-692-0663.

# Hybrid Audit Findings

by: Joe Buben
DSCC-VQH

Periodically, we compile a list of audit findings in order to assist companies with their self audits and to prevent similar problems from occurring at other companies. Below is a partial list of some of the more recent MIL-PRF-38534 hybrid audit findings.

1. Unqualified rework processes were used. Qualified and unqualified rework processes were contained in the same procedure with no restrictions on using the unqualified process on QML product.

The QML system requires all processes including rework to be qualified. Historical data shows many initial qualification failures are due to rework.

2. The wirebond SPC limits were exceeded, however no action was taken.

Failure to take corrective action for out of control processes leads to defective products.

3. Rework limits were not tracked or verified to MIL-PRF-38534.

Excess rework can damage areas surrounding the rework as well as exceed the materials capability for rework. Additionally, "lemons" that are excessively reworked serve as a flag to indicate design or process problems.

4. Time limits from plasma clean to wirebonding were not specified.

To get the improved wirebonding possible with plasma cleaning, devices should be wirebonded as soon as possible after being plasma cleaned.

5. Residual Gas Analysis (RGA) data other than $H_2O$ is not being examined to monitor or improve the sealing process.

Other gasses present in the package provide indications on process and material problems. Passing the internal water vapor limits while having other indicator gasses present will almost assure future failure for internal water vapor content.

6. Particle capture or latch-up operations were used prior to PIND testing, when particle getter was used.

Getter is to be used as a reliability enhancer, not as a garbage collector for contaminants or as a band aid for dirty processing. Other particles not caught may come loose later or have wirebonds or elements over them and cause failure while in use.

7. Devices were not tested over the required frequency range.

Parts not tested over their specified frequency range may fail when used in their application.

8. Fine leak helium bombing was performed without evacuating or purging room air.

Failure to eliminate room air from the pressure vessels can, depending on bomb pressure, dilute the helium detector gas by as much as 50 % and allow fine leak failures to go undetected.

9. Element evaluation data showed the parts failed but were accepted anyway.

Marginal or faulty components lead to marginal or faulty hybrids.

10. Floating, instead of fixed hooks, were used for non-destruct bond pull.

Fixed hooks are required by test method 2023 to prevent the hook from sliding above one bond. Pulls that are made above one bond apply the pull force mainly to that bond. This results in overstressing one bond while understressing the other.

11. The gross leak bomb was not performed.

Failure to use the detector fluid during the pressurization bomb reduces the effectiveness of gross leak testing and may pass non-hermetic parts.

12. Element derating criteria were not specified; elements were not derated.

Elements are derated in order to provide additional reliability. Hybrids without derated components function closer to their maximum ratings thus reducing long term reliability.

13. Customer returns and failure analysis were not tracked to determine patterns or trends.

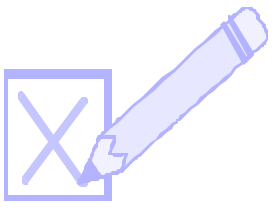
Without a system to track, identify, and trend failures and returns, manufacturers miss opportunities to correct problems. Other customers may have received products in which problems have been previously identified.

It should be noted that audit deficiencies are detected, corrected, and followed up as needed by DSCC-VQH. Visits we have made to non-QML companies or lines show that they have similar and additional items. DSCC VQH does not regularly audit or follow up on deficiencies noted at non-QML companies or lines.

Users or manufacturers that are interested in a more extensive list may contact Joe Buben at joseph.buben@dscc.dla.mil, or at 614-692-0592.

# SMD Misconceptions?

by: Jonnie Schneider
DSCC-VQH



Do you really understand the Standard Microcircuit Drawing Program and the QML? Test your knowledge.

| | |
|---|---|
| **1. A part with an operating temperatures of 0ºC to 100ºC cannot be Class H.** | |
| True. The part will have to be Class E because the temperature range for H is –55ºC to 125°C. Class G is –40ºC to 85ºC, and D is 0ºC to 70ºC. Since 0ºC to 100ºC is not listed an exception making the part Class E is required. | False. Note 5 of Table 1 states that Class H and K shall be –55ºC to 125ºC unless otherwise specified in the acquisition document. Therefore, the SMD or SCD can specify a Class H part at 0ºC to 100ºC. |
| **2. Adding special application requirements like vibration is a just cause for writing a SCD since these requirements cannot be included on the SMD.** | |
| True. SMDs can only be used for standard parts with standard application requirements. | False. The SMD can be written as a Class H with additional requirements like vibration. |
| **3. SMDs can only be written for Class Levels H and K parts.** | |
| True. Class G, D and E parts are not a high enough quality level to use for standardization. | False. SMDs can be written to any of the five class levels. The quality level required for an application is to be selected by the user, not DSCC |
| **4. An OEM must use an SCD (not an SMD) whenever he needs to have configuration control of the part drawing.** | |
| True. The only way the OEM has control of the part drawing is to issue the drawing under his company name. SMDs can be changed with a majority approval of the military services. | False. Any OEM can become a registered user for a SMD. If a change is proposed that the user does not accept, then the change cannot be incorporated for the basic part number. Instead, a "–number " will be created with the change. |

For more information about SMDs, contact Mike Jones, DSCC-VA at 614-692-0512 or via email at michael.jones@dscc.dla.mil

Answers: 1. False, 2. False, 3. False, 4. False

# Call For Newsletter Articles

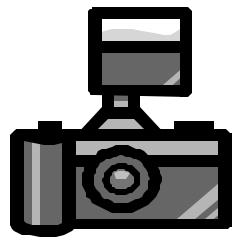
We welcome input from the industry that could be included in future editions of the Hybrid QML Update. If your organization has any activities that are of interest to the hybrid/MCM community, we encourage you to submit material on each subject and we extend our thanks to those who have contributed. Please send your articles to your DSCC-VQH contact or Jackie Cunningham at 614-692-0584 or Brad Deslich at 614-692-0593.

# Photos Anyone?

With the advent of digital cameras, getting good photos of defects and being able to insert them into documents has become much easier. We are currently in the process of compiling defect photos to supplement those in MIL-STD-883 and MIL-STD-750. If you have any photos of defects in hybrids or hybrid components (ICs, capacitors, substrates, resistors, transformers, etc.) that you are willing to share with your fellow manufacturers and users, please forward them to Joseph.Buben@dscc.dla.mil. If you have old fashioned printed photos to share, you may forward them to:

DSCC-VQH
Attention: Joe Buben
3990 East Broad Street
Columbus, OH 43213-1199

Please edit any items you consider proprietary.



# Company Profiles

## VPT Inc. and Delta Electronics

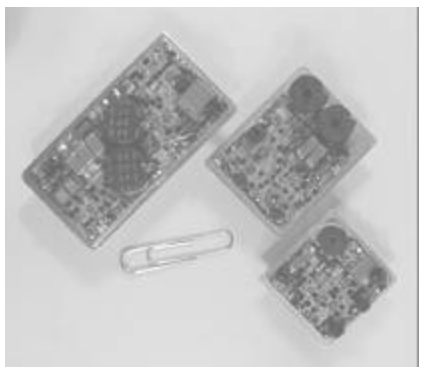
**VPT Inc. and Delta Electronics Joint Venture**
**Achieve MIL-PRF-38534 Certification**

VPT Inc., formed by members of the Virginia Power Electronic Center of Virginia Tech, has performed advanced military and satellite power supply designs for a range of customers including: Wright Patterson AFB, NASA, NRL, Lockheed-Martin, Space Systems Loral, ITT, Orbital Sciences and others. Delta Electronics is the largest commercial power supply manufacturer in the world and a leading supplier of power conversion devices for a broad range of applications worldwide.

A joint venture was formed in 1997 between the two organizations to develop a series of high reliability, high density, low profile and lightweight DC/DC Converters and EMI Filters for military, avionics, space and other applications. The joint venture is committed to maximizing the strengths of both companies to produce superior power products with lower cost and shorter lead-times. The initial four DC/DC converter series- DVSA(6W), DVHF(20W), DVTR(30W), DVFL(120W); and four EMI Filter series- DVMA(1.0A), DVMH(1.5A), DVMC(2.7A), and DVME(15A) are pin-to-pin and functionally compatible with existing industry footprints allowing customers to utilize the devices in systems previously designed in addition to new applications. VPT and Delta have made significant improvements over existing industry products based on customer feedback that include the following:

- Complete Magnetic Feedback without the use of opto-couplers
- Well Controlled Under voltage lock out circuitry to eliminate slow start up problems
- Higher Power Density
- Lower High Frequency Noise over a wider band width
- Eliminate the use of stacked capacitors
- And others

The joint venture is continuously developing new standard products to meet the growing need for cost effective and reliable power conversion solutions. The new product series DVEHF (15W), DVETR(30W) and DVST(30W Triple) have been released recently and they have integral filters that meet EMI requirements of MIL-STD-461 C / D. Previously the use of an external EMI filter to meet these applications added cost and complexity to the power conversion solution for the end user in their applications. These new products make it possible to have a single component solution further reducing the number of interconnects in the system.



Delta Electronics and VPT Inc. recently achieved MIL-PRF-38534 Hybrid Microcircuit certification through the Defense Supply Center in Columbus, Ohio and plans to offer high reliability power conversion devices through this program in the future. In addition the companies are ISO-9001 registered and AS9000 compliant.

More detailed information regarding Delta-VPT and their products can be viewed at www.vpt-inc.com or contact Michael Bosmann at (425)337-2482.

## Moisture and Residual Gas Analysis

by: Phillip Schuessler
Schuessler Consulting

For several years now the microelectronics industry has been struggling to produce drier parts. It has also been several years since any formal studies were done to address some of the contributing factors for this problem. Additionally, the hydrogen phenomenon reported in the late 80s and early 90s continues to plague the industry, and in fact is getting worse as some suppliers continue to cut costs and quality. Elements of construction, heretofore found to be hydrogen free have recently been found to contain absorbed hydrogen, i.e., the precursor to moisture in many packages. Schuessler Consulting has optimized a technique, which allows the manufacturer to evaluate the individual elements of a device to ascertain the sources of moisture and hydrogen. Furthermore, a seminar on these problems has been prepared, which provides the process engineer more insights to what the RGA data mean and how to take full advantage of this informative analytical technique. For more information contact Phillip wh Schuessler at schuessler@aol.com or call at (518) 239-4534.

## Test Optimization Checklist

by: Jonnie Schneider
DSCC-VQH

When a major change or test optimization is approved by DSCC or a TRB, many factors are treated as constants. If these assumptions (constants) are not clearly identified at the onset, failure to monitor them may occur. For example, a company may be primarily captive and their parts may go into ground-based equipment. As a screen, the company may be relying on assembly level testing that is policy to perform. What happens if the company's business focus changes to making equipment to go on-board ships, or aircraft, or the company sells off the assembly division? Now there are issues such as salt-environment, pressure, or a larger temperature range that may invalidate some assumptions about processes, materials, and reliability. Confidence to reduce testing may no longer be well founded.

The assumptions used in making each decision should be carefully thought through and recorded. The change should only be imposed on those products for which the assumptions are valid. Additionally, a method to review that these assumptions are still true should be in place. For example, bond pull is removed as an incoming active die requirement. This decision was made based on the company's internal wafer fabrication line. What happens when the same company buys a few die outside, or the internal fabrication line is shut down, moved, or sold? Is the test optimization still valid?
Following is a checklist provided to help stimulate thinking about what assumptions are being made for test optimization.

1. Product Application Assumptions:
a. Frequency of use (i.e., the part is started daily and runs for 1 hour, the part is constantly being turned on and off, etc.)
b. Conditions of use (i.e., the environment contains radiation, extreme temperatures, humidity, salt, pressure, etc.)
c. Criticality of application (i.e., life dependent, redundancy, etc.)

2. Product Transportation and Storage Assumptions:
a. Conditions of storage (i.e., temperature, time, humidity, etc.)
b. Transportation issues (i.e., vibration, shock, temperature cycles, humidity, etc.)

3. Next Level Assembly of the Product into the System Assumptions:
a. Solder temperatures/times
b. Insertion methods
c. Environmental conditions

4. Material and Component Assumptions:
a. Level of configuration control (i.e., Are all the parameters that have an impact specified, are changes of vendor brought to your attention? etc.)
b. Quality level of materials and components (vendor histories, procurement requirements [QML die, 5011 epoxy], element evaluation, etc.)
c. Control exercised over the supplier (s)

5. Production and Test Assumptions:
a. Through-put (lot sizes, frequency of lot starts)
b. Temperatures, contamination
c. In-process inspections/tests
d. 100% testing
e. Periodic testing

6. Radiation Hardness
a. Die technology
b. Change of vendor

Although the above list is not comprehensive, it is provided to give companies that might be considering test optimization some points to consider to ensure the optimization remains valid as plans change.

## The Cure to the Common RTV

by: Ray Crothers
DSCC-VQH

The following text was sent to QML hybrid manufacturers under DSCC letterhead in regard to use of RTV in hermetically sealed packages.

"In recent audits we have noticed some confusion in regard to the use of RTV in hermetically sealed packages. The discrepancies found fall into two categories both covered by paragraph E.4.2.2 of MIL-PRF-38534. MIL-PRF-38534 paragraph E.4.2.2 states that the cure temperature of polymeric materials will not be exceeded after completion of final seal and that polymerics will meet the requirements of MIL-STD-883, test method 5011. DSCC is concerned by the trend of RTV usage and would enjoy the input of hybrid manufacturers, users, RTV manufactures and other concerned parties.

The first category is exceeding the cure temperature of RTV after seal, for example at temperature cycle MIL-STD-883, test method 1010. Because RTV is usually cured at relatively low temperature we have seen on several audits that the cure temperature was not high enough to exceed the hot temperature used in test method 1010 condition C.

The second category is some hybrid manufacturers' belief that RTV is outside the scope of test method 5011. MIL-PRF-38534 states that the manufacturers will develop an alternate method of ascertaining the necessary quality requirements for materials outside the scope of test method 5011. At this point in time no 38534 certified companies have sent a copy of their approved alternate method to DSCC. MIL-PRF-38534 paragraph 3.7.1 requires that DSCC either approve of alternate methods or be informed of them by the companies' Technical Review Board.

As always, DSCC wants to work with the industry to determine the best way to resolve these issues. At present we are obtaining information from industry experts and some manufacturers of RTV to determine what minimum requirements may be needed for such alternate methods. If your company uses RTV on military products, please send this information to Ray_Crothers@dscc.dla.mil. Specifically, please send the criteria for both acceptance and certification which either the manufacturer or user performs before use.

Also, if the cure temperature is exceeded after seal please, provide data or the rationale to show that there is no reliability concern."

## Stick to the 5011 Getter Tests

by: Jim Eschmeyer
DSCC-VQH

For those companies using getter, you may want to double check that each lot of getter has undergone all of the required incoming tests. Paragraph E.4.2.2 of MIL-PRF-38534 requires polymeric materials such as getter to meet the requirements of test method 5011 of MIL-STD-883. Test method 5011 has acceptance and certification tests for both the supplier and the user of the getter to perform. One particular supplier of getter, however, sells it as a dielectric gel and, in the past, has shown no interest in performing and providing results of the supplier tests of 5011. Therefore, the user, i.e., the hybrid manufacturer, is responsible for performing both the supplier and the user tests. Based on retention reports that we have received from laboratories on our *List of Commercial Laboratories Suitable for Testing Military Devices*, we have reason to believe that some hybrid manufacturers may not be performing the required 5011 tests, specifically those tests that the supplier of the getter did not perform. For example, thermogravimetric analysis (TGA) is a required acceptance test that is typically performed by the supplier. When a hybrid company receives its getter and there is no evidence that the supplier performed TGA, the incoming getter will usually need to be sent to a laboratory who has suitability for TGA, since most hybrid manufacturers do not have the equipment to perform this test.

We have called the companies who may have assumed that the supplier had performed the required tests. Just in case we missed you, if you use getter in your parts and did not get a call from us, you may want to verify that all of the required 5011 tests are actually being performed. It may be less embarrassing to find out now rather than on your upcoming DSCC audit.



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