Hybrid QML Update

Issue 13 **May 2003**

Tales of a Test Op

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MIL-PRF-38534 QML Manufacturer

Many of us here at Agilent Technologies have long felt that RGA / Internal Water Vapor Content testing provided little or no value to our QML hermetic optocoupler products. This was not a test that we consistently passed with ease though. Many lots were scrapped due to high readings and customer issues abounded due to inconsistent lab results. A tremendous amount of money was spent on updated equipment and engineering time, none of which resulted in better lab results. While MIL-PRF-38534 allowed for optimization, or better yet, elimination, how does one prove that failing results are inconsequential to the product?

Agilent's hermetic optocouplers have quite a unique manufacturing design and process. IC's are placed in the ceramic package cavity and LEDs are placed on a separate insert. The insert is flipped over and attached to the package with solder joints. This allows a sandwich construction with the LED mounted directly over the phototransistor, which provides excellent optical coupling. We then fill the device with a potting compound consisting of silicone gel. All active elements are encapsulated in the gel. Filled too low, the device will fail electrical testing, too high and it will not allow a proper seal. The filled device has a very small free air volume of 0.01 to 0.04 cm^3, depending on package type. Both the free air size and the compound itself may have played a part in our inconsistent lab readings. The silicone gel has two primary functions: 1) to provide a high voltage dielectric insulation barrier between the LED and IC, and, 2) to provide an optical light coupling medium. We also believed that the compound provided a moisture barrier to the active elements and that RGA readings were irrelevant.

Agilent's Quality and Reliability engineers were not unreceptive to the idea of eliminating RGA testing. After all, they were the ones performing failure analysis on virtually all devices returned as defective. Additionally, they analyzed all our in-process failures. Upon the realization that they had never seen water related failures in our 25 plus years of manufacturing hermetic optocouplers, they were convinced that we should move forward with the elimination.

After long consultations with our DSCC liaisons, we decided to put our devices to the test and positively determine if the silicone gel fully protected the elements from moisture. If the reports of high water content in our devices were accurate (as reported by various labs), then we wanted to exacerbate that condition. We decided to run some devices for an extended amount of time in an 85/85 test. We chose devices (right off the line with no special processing) with the silicone gel in the package cavity and did not attach lids to the devices. The unsealed devices were reverse biased so as not to generate any heat. The IC was not energized (no switching going on) and the LED was not "ON" (the bias was there to create an electrolytic cell to speed up ionic movement).

At the beginning we were undecided on how many hours we would run the test. We took the parts down at 48 hours and electrically tested them. All passed. We put them back up and repeated the process of electrically testing at 96, 168, 500, 1500, and 2000 hours. No failures were found. Realizing that this test could potentially run too long, we decided to perform a bond pull and ball shear every 500 hours along with taking SEM photos. This was done up to 5000 hours when we decided that enough was enough. We still had almost half the gel filled devices left, had found zero electrical failures, bond pull and shear data were all well within limits, and SEM photos all looked good. We took this to DSCC and asked if we could discontinue RGA testing.

DSCC said "not yet". They brought up a very good point that we had simply taken for granted but had not yet proven. What about old parts? What if the gel degrades? Our mission was to find 10-year old parts, compare the look and feel of the compound with a new part and perform bond pull, ball shear, and SEM. After an intense search, four devices were found. The required tests were performed and all passed. The gel has the same consistency and looked identical to current control devices. This information was also very beneficial in our PIND test elimination request, which was also granted.

After a few more question and answer sessions with DSCC, their internal process concluded. Our RGA elimination request was granted. RGA is a very volatile issue as many people are aware. Issues abound. Very strong and passionate opinions are voiced. We greatly appreciate DSCC's professionalism and willingness to work with us on this very complex issue. In the end it didn't really matter that our lab test results were so inconsistent. What mattered is that we could prove that there were no reliability concerns if the readings were high or low. Agilent's hermetic optocouplers are robust enough to function for a very long time in a very wet atmosphere as shown by the 85/85 testing.

Some required tests might not be of any value due to many variables: technology, manufacturing processes, material used, etc. This was understood when MIL-PRF-38534 included the ability for manufacturers (who know their parts best) to have more control over their processes without jeopardizing quality or reliability. Optimization is a great solution when the product is inherently capable of meeting a certain test, such as PIND for us. In order to eliminate a test where the failure rate is far less than optimal, a great deal of out of the box thinking had to occur. The process was lengthy for us and, on occasion, frustrating for all those involved but we got through it, and learned a lot in the process.

Editor's note: Test optimizations or alternate methods allow manufacturers to address a particular MIL-PRF-38534 requirement with a justified alternative approach. DSCC continues to support the efforts of QML hybrid manufacturers to optimize and eliminate non-value added tests as a way to capitalize on technology maturity and reduce cost. All test optimizations are reviewed by DSCC and are assessed periodically for continued suitability.

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.dscc.dla.mil/offices/VQ, or 614-692-0663.

Passive Element Voltage Conditioning

By: Binh Tonnu
DSCC-VQH

MIL-PRF-38534, Table C-III requires that passive elements used in Class K hybrid devices undergo voltage conditioning or aging at incoming inspection. Similar to burn-in for active devices, voltage conditioning can eliminate marginal passive elements with inherent defects. We have received some inquiries from manufacturers on the aging requirements because MIL-PRF-38534 does not clearly identify them. Several military specifications for different types of capacitors, resistors, transformers and inductors used in hybrids were reviewed and from this we can provide the following voltage conditioning references. The conditioning guidelines vary per component and are too lengthy to list individually here, but in general, they consist of operating the component at an elevated temperature under up to twice the maximum rated voltage for a specified period of time. This is followed up with some electrical testing. The guidelines can be used by the manufacturers when developing or specifying voltage conditioning procedures. As with all incoming inspections, aging or conditioning can be done by the supplier, a laboratory, or the hybrid manufacturer. Passive elements procured under certain DSCC QPL military performance specifications will have been exposed to voltage conditioning by requirement.

FSC: 5905 Component: Resistors

MIL-PRF-914 Rev A, Resistor Networks, Fixed, Film. Surface Mount, Non-established Reliability and Established Reliability, General Specification For - Para. 4.8.4, Power conditioning

MIL-PRF-39007 Rev H, Performance Specification, Resistors, Fixed, Wire Wound (Power Type), Non-established Reliability and Established Reliability, and Space Level, General Specification For - Para. 4.8.2, Conditioning

MIL-PRF-55 182 Rev H, Resistors, Fixed, Film. Non-established Reliability and Established Reliability, and Space Level, General Specification - For. Para. 4.8.4, Power conditioning

MIL-PRF-55342 Rev G, Performance Specification, Resistors, Fixed. Film, Chip, Non-Established Reliability, Established Reliability, Space Level, General Specification For - Para. 4.8.4, Power Conditioning

FSC: 5910 Component: Capacitors

MIL-PRF-55365 Rev D, Capacitor, Fixed, Electrolytic (Tantalum). Chip, Non-established Reliability, Established Reliability, General Specification For - Para. 4.7.3, Voltage Aging

MIL-PRF-49470 Rev A, Capacitors, Fixed. Ceramic Dielectric, Switch Mode Power Supply (General Purpose and Temperature Stable), General Specification For - Para. 4.8.5 Voltage Conditioning

MIL-PRF-l23 Rev B, Capacitors, Fixed, Ceramic Dielectric. (Temperature and General Purpose), High Reliability, General Specification For - Para. 4.6.6.2 Voltage Conditioning

MIL-PRF-5568l Rev E, Capacitor. Chip, Multiple Layer, Fixed, Ceramic Dielectric, Established Reliability and Non-established Reliability, General Specification For - Para. 4.8.3, Voltage Conditioning

FSC: 5950. Component: Coils, Transformers

MIL-PRF-l5305 Rev E, Coils, Electrical, Fixed and Variable, Radio Frequency, General Specification For - Para. 4.8.13, Life test

MIL-PRF-2, Transformers and Inductors (Audio, Power, and High Power Pulse) General Specification For - Para. 4.7.10, Induced voltage

If the test requirements are not appropriate for the technology, the manufacturer should determine alternate voltage conditioning procedures. If you have any comments or suggestions, please contact Binh Tonnu at 614-692-0586 or binh.tonnu@dla.mil.

My Week at RGA Camp….

By: Jim Eschmeyer
DSCC-VQH

Several engineers from DSCC's Sourcing and Qualifications Unit (i.e., the auditors) and our Product Test Center (i.e., Test Lab) recently were trained to use our in-house RGA equipment. This training was necessary because of the departure of the person who had previously run the equipment. Mr. John Pernicka of the Pernicka Corporation was the instructor. He was asked to teach the class because our RGA machine was originally manufactured and recently upgraded by the Pernicka Corporation. The training lasted for one week and included a variety of topics, including the physics of mass spectrometry, operation of the equipment, understanding the software, and maintenance.

This training will benefit not only DSCC but also the manufacturing and user industries. The auditors' increased knowledge and hands-on experience will make future audits more effective and thorough. The DSCC Test Laboratory now has more than one person who can build correlation units and perform testing. Therefore, if somebody departs for greener pastures or is busy with other tasks, we should not undergo much, if any, of a delay in our Correlation Program. Also, since the two groups (test lab and auditors) trained together, we hope the spirit of teamwork that we had during the week will continue as we work together to improve the Correlation Program.

Since we have learned to operate the RGA equipment, our next step is to work toward resuming the Correlation Program. Our coworkers in the Test Lab are learning how to make precise and repeatable correlation units. They are also making improvements to the glove box and have purchased and installed better tubing for use in making correlation units. We are optimistic that these improvements will improve the precision and repeatability of the correlation units. We then hope to send out the Round 3 correlation samples as soon as possible. As in the past, we will keep everybody informed of the results.

If you have any questions, please contact Jim Eschmeyer at (614) 692-0591 or james.eschmeyer@dla.mil.

Certificates of Conformance

By: Brad Deslich
DSCC-VQH

One of the many tasks DSCC's Hybrid Devices Team undertakes related to the QML-38534 hybrid program is the review of certificates of conformance (C of C) for the compliant hybrids DSCC buys. This involves a close look at the manufacturer's C of C document to see if the appropriate statements are present to accurately depict the part's manufacturing history, reliability level, part number, quantity supplied, etc. The obvious reason this is done is to obtain written confirmation that the supplier has fulfilled his obligation under the contract to produce a compliant hybrid.

Manufacturers and distributors who offer devices compliant to MIL-PRF-38534 are to provide written certification that the devices meet all applicable requirements. In particular, MIL-PRF-38534 provides specific wording that the certificate should address including language to the effect that the devices are built, tested, and handled in accordance with MIL-PRF-38534 and that they met or exceed the performance requirements for the applicable class, i.e., Class H. All QML-38534 hybrid manufacturer's C of Cs for compliant and QML devices should contain a statement like this. Merely certifying that the devices meet the applicable purchase order, or drawing, or that they were tested in accordance with MIL-STD-883 for example does not adequately address the intent of the certification of conformance requirement of MIL-PRF-38534. Without directly referencing the specification in the C of C, one has to trace back through purchase orders, customer SCDs, and drawings, and so on to determine what specifications are applicable. All QML hybrid manufacturers are encouraged to review their C of C document to make sure this requirement is addressed.

Would you like to sell hybrid microcircuits, or anything else, to DSCC?

By: Jonnie Schneider, DSCC-VQH

Here's how you do it:

1. Go to www.dscc.dla.mil on the World Wide Web.
2. Select "Search the DSCC Web Site"
3. Click on "Request for Quote" (RFQ). Now you want to only look at RFQs you could actual supply.
4. So do a search by FSC. (This is where it comes in handy to know the Federal Stock Classes (FSC). Electronic parts always start with "5". FSC 5962 is microcircuits, 5961 is semiconductors. For a more complete list of electronic FSCs go to http://www.dscc.dla.mil/programs/qmlqpl/. Click on the FSC column and this will sort by FSC. This is not a complete list, but it covers a lot of parts).

A screen like this might show up.

Figure 1

DSCC RFQs Federal Supply Class Search Results

[RFQ Search | Recent RFQs | RFQs by Issue Dt | RFQs by Return By Dt | FSCs | RFQ Auctions]

All RFQs for **FSC** Like **5962** sorted by NSN

Records 1 thru 25 of 1937 Records.

Pages: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 »» of 78

Click on the Solicitation # to view the RFQ & NSN/Part No. to view additional info..

#	NSN/Part No. / Nomenclature	Bidset/ Drawings	Spec/ Stnd	Solicitation #	Auction Status	PR # / PR QTY	Buyer	Issue	Return By
1	5962-00-053-7979 MICROCIRCUIT, DIGITAL	Delved	None	SP09003TAP14		VPE03051000037 qty 74	POC	2/20/2003	3/6/2003
2	5962-00-133-9031 MICROCIRCUIT, LINEAR	None	None	SP09003TY684		VPE03041000050 qty 235	POC	2/10/2003	2/24/2003
3	5962-00-137-6485 MICROCIRCUIT, LINEAR	None	None	SP09003L08226		VPE02224000463 qty 10	CAARO	11/12/2002	11/26/2002
4	5962-00-138-1526 MICROCIRCUIT, LINEAR	DWG Avail	None	SP09003TK552		VPE02351000026 qty 12	CAAEV	12/17/2002	12/31/2002

5. Select an item like the fourth item and click on the NSN number.

- Here is an example screen that you might find. Does any of it mean anything to you? If so, you're good! Let's try to decode a few things below.

Figure 2

NSN: **5962-00-138-1526**
Nomenclature: **MICROCIRCUIT,LINEAR** AMSC: G

SPEC/DWG/STND:

I/A/W DRW: **92220 M511-104-0001 (BASIC)** DTD: **8/30/1971**

Open Solicitations

Solicitation #	Bidset / Drawing	SPEC/ STND	PR #	QTY	Buyer	Issued	Return By
SP0900-03-T-K552	DWG Avail	None	VPED2J51DDDD26	12	CAAEV	12/17/2002	12/31/2002

- **NSN** stands for National Stock number. A unique NSN is assigned to every part managed by DSCC. The first 4 digits are the stock class. The next two indicate what country initiated cataloging the part. "0 and 1" are both U.S. The last seven digits, called the National Item Identification Number (NIIN), are just unique numbers.
- **AMSC** (Acquisition Method Suffix Code) indicates how the part will be bought. G means DSCC has all the data needed (drawings), and can use the method "full and open competition." Some other codes you may see are T, which means QPL or QML suppliers are the only sources allowed or B, or C, both of which are restricted to "approved suppliers" like a Source Control Drawing, or where there is not adequate drawings to communicate what is required to a new vendor.
- **I/A/W** means "in accordance with" the drawing listed next to it. The first five digits of the drawing number are the cage code of whoever issued the drawing. Then you see the actual drawing number and issue date. Sometimes you will see an amendment or product type after basic if there is an amendment or selections within a document are appropriate. You might also see other documents, if they apply.

To look up a manufacturer's CAGE Code, go to Search on the website and select CAGE. Plug in the CAGE Code and hit run. 92220 comes up as Figgie International with an address and phone number. In this case you won't need them, but if the drawings were not available, you would be talking to Figgie to try to get a copy of the drawing.

- The **Solicitation number** here begins with SP0900 – that means DSCC and electronic devices. The number "03" indicates the year it was posted. If you click on this hypertext (on the web-site) you will see the entire solicitation.
- "**Bidset/Drawings**" are all the drawings required to define the part. This could be a standard microcircuit drawing and general specification, or it could be a whole pile of drawings from assembly layout to electrical test. In this case you see "Avail," this means DSCC has the drawings and you can get them by clicking the "DWG." Note: Drawings are only available for download during the solicitation process.
- **Procurement Request "PR"** Is the document the DSCC Item Manager generates to request DSCC purchasing to put out the solicitation and therefore the solicitation reflects the PR requirements.
- Yes! "**QTY**" means how many DSCC wants to buy and in this case its only 12.
- "Buyer" is the individual at DSCC who is buying the part. If you have any questions or clarifications you can click on the office symbol (CAAA), and you will find the name and how to contact information. Note: The buyer is restricted on what they can tell you in order to allow for fair competition.
- **"Issued" and "Returned by" dates** are self-explanatory. What you need to be careful of is that the Government buying system is very regulated, and in order for a quote to be considered, **YOUR QUOTE HAS TO BE AT DSCC BY THE "RETURN BY" DATE.**

6. Now, click on "DWG." Notice that two drawings now show up. You will discover if you look at the drawings that 601 gives you the general hybrid requirements, and M511-104 is the device details like case outline, electrical, circuit, etc. To view the drawings click on DWG, then you have to click on each page. Have fun trying to read it. A special viewer may be required to There will be controls to let you make it bigger, smaller, rotate it, etc. I once sent one that could only be read in the mirror.

Figure 3

7. Now click on the solicitation number. Some important things to notice

View Available Unrestricted Drawings in Sheet Mode DWG

NSN: **5962-00-138-1526**

CAGE	Drawing #	REV	DOC Type	Title	DISTRB	Status
92220	601	F	ST	HYBRID MICROCIRCUIT	A	Available
92220	M511-104	B	SC	HYBRID MICROCIRCUIT, REMOTE OUTPUT DRIVER	A	Available

- "FOB" means where acceptance will be done. Notice that "Destination" is listed below FOB. This means you need to include shipping costs in your proposal because you will ship the parts, and inspection and acceptance will be done at receipt.
- You can show higher volumes with a price break as well as the 12 we are looking at.
- Form 239 is a form DSCC quality technicians complete to specify special quality requirements such as first article inspection (FAT). When a 239 form applies, request a copy from the buyer so you can be sure to include these requirements in your quote.
- Be sure to include the cost of having the special packaging and bar coding in your quote.
- In all quotes, be very clear who is actually making the part. You may be the supplier and not the manufacturer. This is very important on jobs where the sources are restricted.

8. Do you want to quote? Go back to figure 1. See the quote button. Click on it (on the web site of course). At this point you will be informed that you needed to register. Follow the directions to get registered – hopefully some time in advance. (You can get to registration at any time from the DSCC main web page by selecting "Selling to DSCC." Then you can just answer the questions the screens ask you for quoting).

9. You won the award! Good for you! Now be careful to read the whole contract (Award), including referenced documents. If you have any questions, our post-award contact for active devices can be reached at 614-692-7495. Remember these parts go in weapon systems that you, or your sons and daughters may be using to defend themselves. Deliver good product that meets the drawings, on time, at a reasonable price.

For more information on this topic, contact Jonnie Schneider at jonnie.schneider@dla.mil.

GEIA G12 Solid State Devices Committee

The Government Electronics and Information Technology Association's (GEIA). G12 Solid State Devices Committee is a part of the Electronic Industries Alliance (EIA) and is the national trade organization that represents the electronic industries interests in the United States. This organization supports and advances national defense, economic growth, technological progress and all the interests of the electronics industries compatible with public welfare. The Government arm of EIA is the Government Electronics and Information Technology Association (GEIA).

The GEIA G12 Solid State Devices Committee is chartered to address issues regarding solid-state devices intended for use in high reliability systems. The committee's recent focus addresses improvements in critical test methods and the use of commercial microcircuit devices and commercial practices in our ruggedized and high reliability systems as well as traditional military/QML product. Key topics and issues being worked include improvements in the Residual Gas Analysis (RGA) test method and monitoring techniques, the impact on our industry of internationally mandated lead free soldering requirements, diminishing manufacturing sources (DMS), commercial space suitable components, and semiconductor specification upgrades.

G-12 currently has 2 active major subcommittees, Space Parts, and Plastic Encapsulated Microcircuits (PEM) and 18 related task groups. The RF/microwave devices and Hybrid devices subcommittees are sitting idle awaiting issues serious enough to demand attention. We now have 19 active company memberships and 3 observing company memberships with an average of 16 companies represented at each meeting. Meeting attendance averages 75 folks including our JEDEC, DOD, and international attendees.

The G12 committee meets concurrently three times per year with the JEDEC JC13 committees. In addition to the device and systems manufacturers, attendance includes representatives from various government organizations, (NASA, Air Force, Army, Navy, GIDEP), international partners (OEMs, ESA, NASDA, MOD and others), independent agencies, national laboratories and interested parties such as research laboratories and companies performing specialized test and evaluation work. Our principal working partner for the US government is the Defense Supply Center Columbus (DSCC) with several active working participants attending each meeting.

The joint meetings and task groups have fostered strong cooperative efforts between G12, JC13, and the US government. They have proven that working together in a "joint environment" is very efficient and allows numerous issues, viewpoints and perspectives to be considered and addressed on the spot. The typical cycle time from an initial proposal to an accepted specification or standards change has radically decreased since the joint meeting environment was established. Occasionally special meetings are called when needed to focus on specific issues of subcommittees, task groups or point committees. A significant amount of work is performed in task groups and often between meetings via email and teleconferences.

You can find more information about GEIA's G12 at this web site: http://www.geia.org/sstc/G12/index.htm

With a login id and password one can access meeting schedules, notices & minutes, sub-committees sites, correspondence and direct links to many other relevant sites. For password access, please contact Mike Cooper, G12 Chairman (Mike.Cooper@gdc4s.com)

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HYBRID QML UPDATE - CHECK IT OUT!

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