NEWS

Volume 13 • Issue 1 • April, 2015

sti electronics inc.®

Leading the way in electronics




DAVE'S WORLD

By: Dave Raby

April, 2015

As usual, it has been an interesting few months at STI. We had a great year in 2014 and that is allowing us to devote resources to growing on a faster pace in 2015. I mentioned last time we were looking for instructors. Since then, we've added three full time instructors and still could be looking at more in the near future. Andy Mitchell joined (or rejoined, more on that later) STI in January and is our Center Manager in Texas. He's responsible for making sure STI is actively engaged in the area and that he and Julio are giving the best training to the most people possible. Patti Gander joined us at the end of January as our Florida Center Manager and will be responsible for growth and expansion of training classes in her area. Patti is also a curriculum development person which is a growing portion of our business and while I'm happy we'll be offering our traditional classes in Florida, I'm really excited about her bringing to STI classes that are different than the soldering related classes we've taught for the past 30 years. There are more details on those new offerings inside this newsletter and I look forward to expanding those offerings as well as moving them to our other training locations. Darlene Hoffer joined our Madison training staff in late February and I believe will fit right in with the best set of instructors anywhere. I look forward to you getting to know these folks as your training needs bring you through any of STI's facilities or as we come to yours.

I mentioned Andy joining or rejoining us. He was actually one of the first 4 STI (Soldering Technology International back then) employees and the first not named Raby. He left his job as a CAT C instructor at China Lake to join us in the early 1980's. He was with us for a few years in San Dimas before joining American Hakko and now is back.

Our manufacturing area and analytical labs continue to grow as well. A couple of big projects are in the works that I'll hopefully be able to talk about in the future. We have added IPC/QML and South African QAR Intrinsic Safety certifications to our list of qualifications and will be adding another big one soon.

It's also trade show/conference season. I attended the Pan Pacific Conference which is always one of my favorites of the year because of the quality of the papers, people attending from all over the world and the intimate atmosphere and networking that happens there. The location and timing, Hawaii in February, isn't bad either. Next up was Apex which is the best US show for seeing what's new from suppliers. Thanks to everyone who stopped by the booth to discuss our product and service offerings and to say hello. Jim and Ellen were able to make the trip and enjoyed seeing everyone. We are also exhibiting in Dallas (twice), Houston, Atlanta, and Huntsville in the next couple of months so please watch for information on these.

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STI was one of the sponsors last month of Connect Madison which featured the State of the City address. Mayor Trulock's remarks about STI were way too kind but very much appreciated. We were also happy to be included in Madison's marketing video. Thank you for your support and please let us know if there is anything we can do to serve you better. You can contact me or anyone else listed anywhere in this newsletter.

Please follow me on twitter (@daveraby) or facebook (STI Electronics).

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Follow us on Linked In, Facebook, and Twitter for a chance to win an iPod Mini. Drawings will take place after the release of each newsletter from our list of Social Media followers.

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Manufacturing Engineer
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Vibration Testing:

Exposing the Weak Link (Part 2 of 2)

Weak links exist in all designs and, over the course of time, will manifest themselves under the right conditions. The aim of testing is to impose realistic conditions and capture any subsequent failures.

Shown below is a sample circuit card used to demonstrate a method of establishing reasonable life expectancy estimates for critical electronic systems. The circuit card assembly (CCA) shown in Figure 4 contains two Ball-Grid Array (BGA) components, presumably for the purpose of processing critical data within the larger system. Though it is not a fully functional CCA, we will treat it as such for the purposes of this discussion.

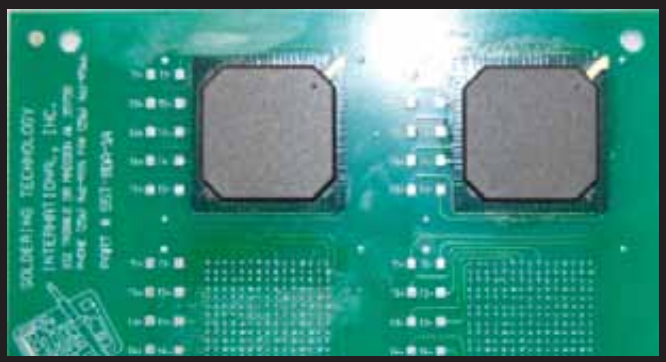

Figure 1 Sample CCA

This simple board is approximately 3 X 4.5" and is .060" thick. It has its first two natural modes at approximately 423 and 1004 Hz, respectively as shown in Figures 2 and 3. These two figures show the computer model's predictions for frequency and exaggerated shape of the first two natural modes, and could serve as justification to proceed with product development activities, provided the results are acceptable. Validating these computer predictions can be performed through a variety of means, but the most cost- and time-effective is testing.

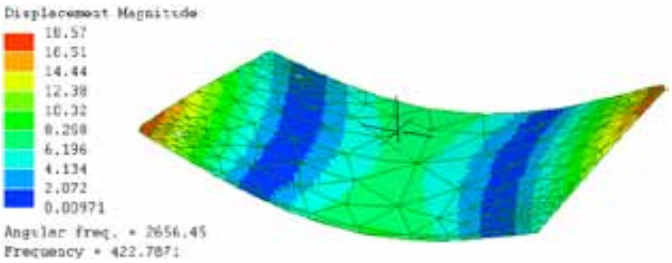

Figure 2 Computer Model Prediction of First Free-Free Mode (423 Hz)

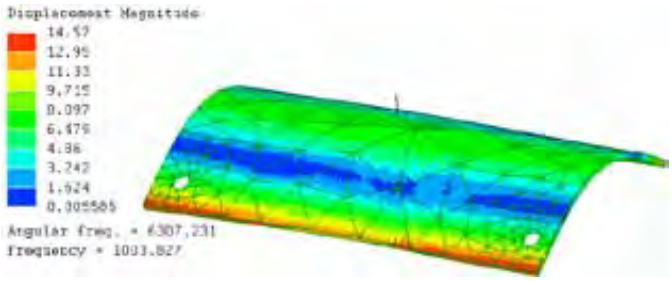

Figure 3 Computer Model Prediction of Second Free-Free Mode (1004 Hz)

Performing what is commonly referred to as a "ping test" allows for the production of a frequency response spectrum. A frequency response spectrum is a graphical representation of the frequencies at which a system naturally resonates. The board is suspended using elastic supports (as shown in Figure 4), outfitted with one or more accelerometers, and gently tapped. The elastic supports only provide resistance to motion in the very low frequency range (below 100Hz), permitting the board to move relatively freely in all

six degrees of motion. The response to the tap (or ping) is measured by the accelerometer and captures that response in the frequency domain and is shown in Figure 5. Motion around 400 and 950 Hz is amplified, while motion around 600 Hz is attenuated (or dampened). These responses are fairly close to computer predictions, which estimated the first two modes to occur at 423 and 1004 Hz. A subtle, but important distinction can be made here. The computer model does not contain any parts, however, the real hardware does. The impact of the presence of these parts is an addition of weight, which reduces the resonant frequencies. The computer model over-predicts the response of the hardware. Correlation between the model and reality is performed in this case by adjusting the computer model. This adjustment involves increasing the density of board material to the point where the model frequencies are reasonably close to the frequency response spectrum produced during the ping test. An 11% increase in density has the effect of simulating the additional mass of components and reducing the first two modes to 398 and 962 Hz, respectively. This correlated board model is used in subsequent modeling and predictions.

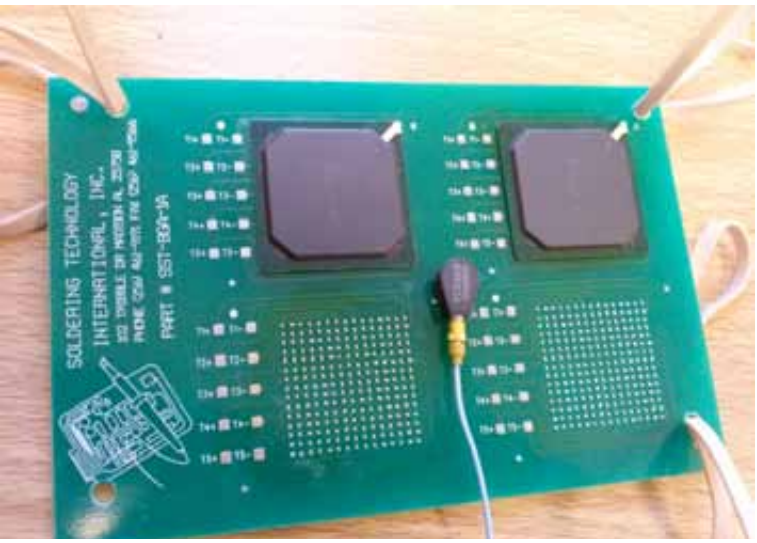

Figure 4 Sample CCA Ping Test Setup

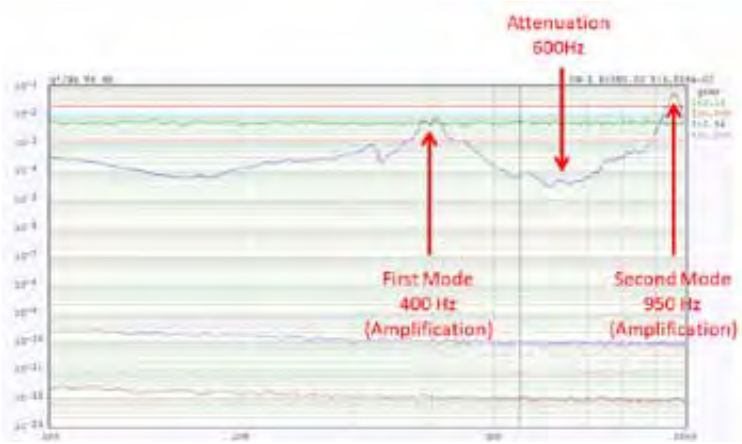

Figure 5 Frequency Response Spectrum for Sample CCA

It is well-known that the frequencies at which the board resonates are typically lower when unrestrained than when restrained. This is one of the reasons they are fastened down to more rigid structures. For our example, the board is attached to a more rigid structure using the hole-pattern on the four corners. Bolting the board to a rigid structure, the computer model predicts that the first two modes change in shape and increase in frequency, as shown in Figure 6 and Figure 7.

Overlaying the mode shape and the board image (Figure 8 and Figure 9), it is revealed that the most stressed component on the board is the center BGA. Specifically, the corner pins toward the center of the board will exhibit the highest stress levels at the first mode (486 Hz). When restrained by the four mounting holes, any environment that drives this CCA with a 486 Hz oscillating force will excite this mode, causing increased stress levels on the solder connections in the stressed corner of the BGA.

This area is a prime candidate to be the weakest structural link in the CCA design. Should a solder connection fail

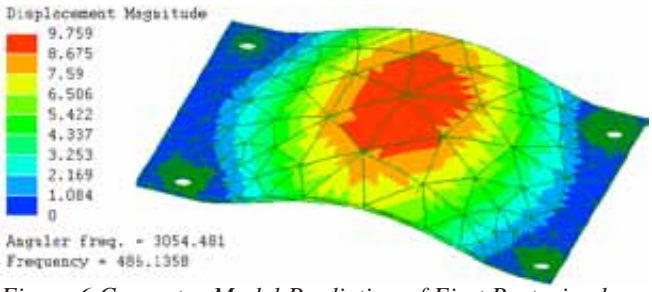

Figure 6 Computer Model Prediction of First Restrained Mode (486 Hz)

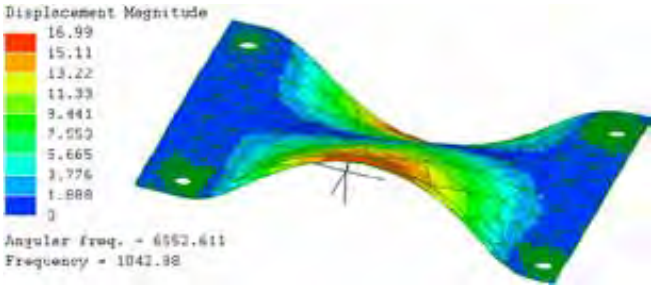

Figure 7 Computer Model Prediction of Second Restrained Mode (1043 Hz)

mechanically, all other factors being equal, the failure will likely occur in this region. Validating and quantifying this hypothesis is the aim of subsequent vibration testing. In quantification, the aim is to determine a reasonable limit on the expected lifetime of the CCA under representative vibration environments. How long should the board last under known conditions?

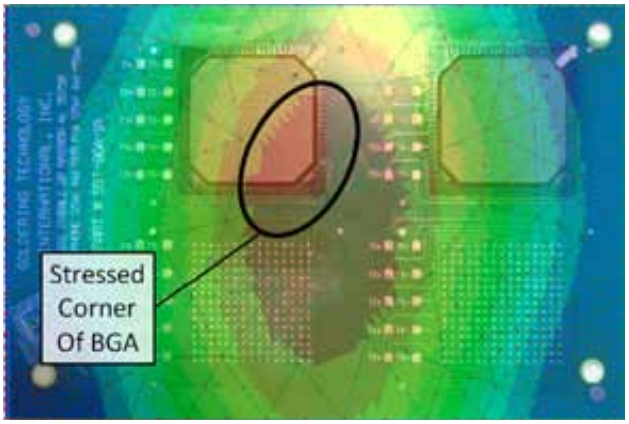

Figure 8 Computer Model Prediction of First Mode Stress Areas

This area is a prime candidate to be the weakest structural link in the CCA design. Should a solder connection fail mechanically, all other factors being equal, the failure will likely occur in this region. Validating and quantifying this hypothesis is the aim of subsequent vibration testing. In quantification, the aim is to determine a reasonable limit on the expected lifetime of the CCA under representative vibration environments. How long should the board last under known conditions?

If we suppose that the system is intended to be deployed on the wing of a jet aircraft, we can bound our expectations by testing to that environment. MIL-STD-810 actually puts quantifiable values to such environments, which facilitates the effective design, manufacturing, and usage of hardware in harsh environments. Jet aircraft vibration exposure, for example is defined in Figure 514.6C-6 of the specification. The graphic of Figure 10 (below) shows this vibration exposure. Of particular interest is the increased vibration energy between 300 and 1000 Hz. Comparing the model-predicted first two modes to the vibration profile reveals a potential problem. The vibration profile introduces significant vibrational energies at resonant frequencies. The board is therefore expected to experience significant mechanical stresses. The impact of such stresses is

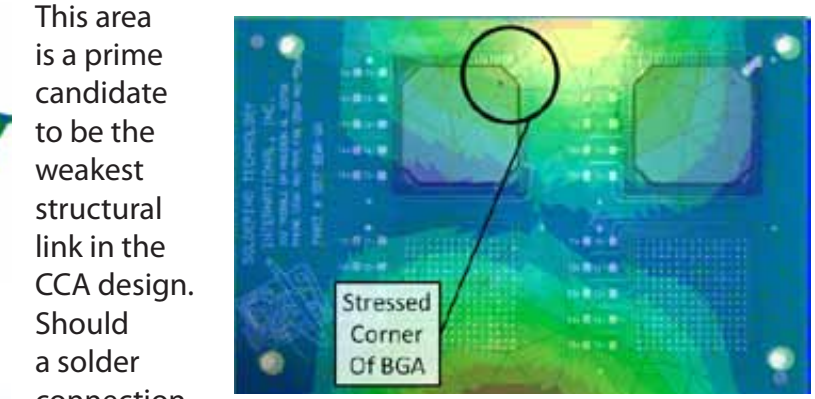

Figure 9 Computer Model Prediction of Second Mode Stress Areas

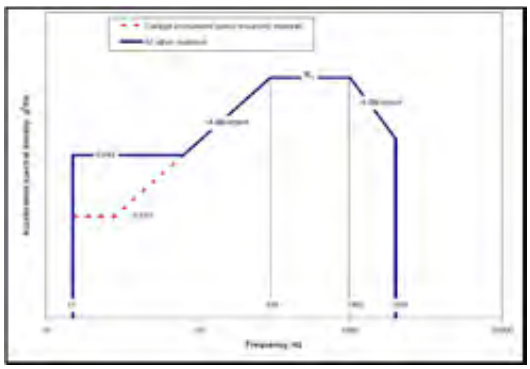

Figure 10 Jet Aircraft Vibration Exposure

made apparent during testing.

A +6 dB scaled jet aircraft vibration profile was imposed on the example CCA. The increased levels are imposed in order to qualify the design. In other words, a harsher environment is used in order to definitively establish that the design is structurally adequate for the expected environmental loads. The test setup is shown in Figure 11, and depicts the usage of four standoffs supporting the board as it would be in its deployed state.

Figure 11 Vibration Test Setup

The board is attached to the shaker table head and instrumented with reference and response accelerometers. The reference accelerometer provides a feedback loop for the vibration controller. The response accelerometer is used for model correlation purposes and captures the response of the board under load. Ideally, strain gauges are installed in problematic locations to quantify the stress/strain of the hardware under load. This test setup was conducted for 2 hours before continuity tests indicated that the solder connection between the parts and the board had been compromised.

Clearly, this design is not necessarily adequate for service after exposure to the expected vibrational profile. At this point, the design would need to be modified to be less susceptible to vibrational damage. Figure 13 shows the response of the hardware during testing. The response accelerometer identifies the presence of substantial vibrational energy being dissipated around 375Hz. Using this information to correlate the computer model allows for design changes to be quickly vetted electronically with minimal resources. For example, additional mounting holes could be added to restrain the center of the board. An isolation system could be incorporated to reduce the transmission of certain frequency bands to the hardware. Critical components could be relocated to less stressful areas of the board. The combination of analysis and test allows for better identification and remedy of weak links within CCA designs.

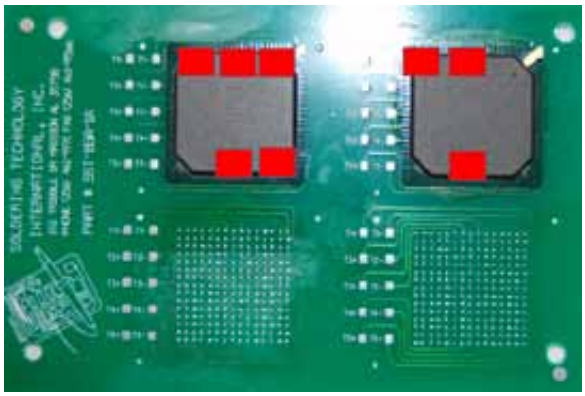

Figure 12 Areas with Open Connections

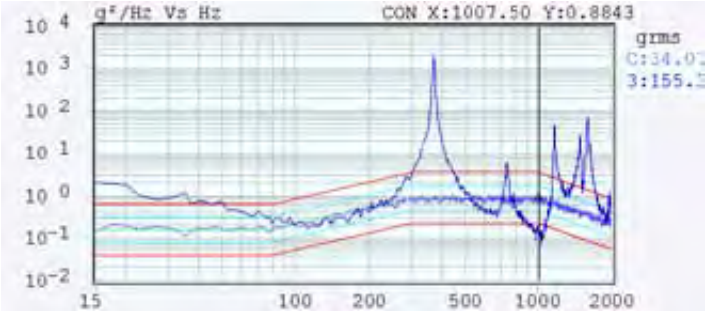

Figure 13 Vibration Environment Response

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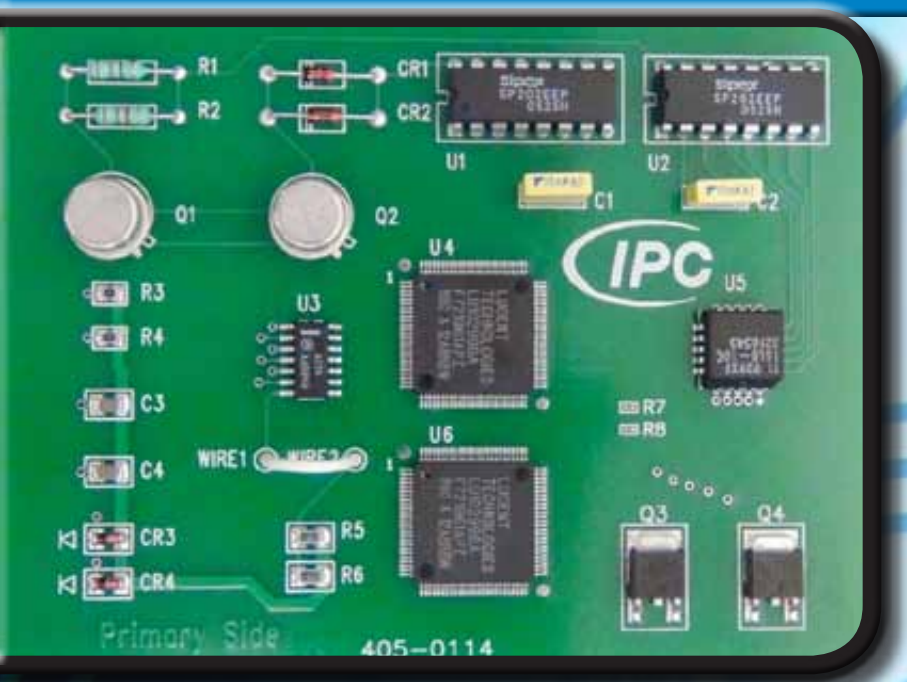
NEW PRODUCTS



NEW

J-STD-001F Certification Kit

The new STI, IPC J-STD-001F Certification Boards and Kits are in inventory and ready to ship. These new Revision F Kits were used in the J-STD-001F Beta training here at STI and also in Europe at ART with great success. The modifications to the traditional Certification Kit were created at the request of the IPC 001 Training Subcommittee during the IPC fall meeting in Chicago last year. The previous (traditional) 001 Training Kit was developed by STI in 1998.

The new Revision F kit replaces the single QFP-100, with 25 mil spacing with two QFP100 at 20 mil spacing, similar to the QFP we use in the IPC-7711 Rework Certification Kit. Additionally there is two 0402 chips and bottom termination DPAKs added to the Kit. This component selection should provide additional challenge to students during the practical portion of the Certification Training. It's interesting to note that the DPAK components were used in the STI SMT Kit and also on the NASA SMT workmanship kit. Both of which are still available from STI.

During the transition to the J-STD-001F Training Program and based upon customer demand we will continue to offer the traditional J-STD-001 kit for our customer use.

Our feature Training Kit for this edition is the NEW J-STD-001F Training kit. Your choice Tin Lead or Lead Free and both are in stock.

Mention this article to your favorite STI Customer Service Representative and receive a 10% discount during the release month.

As always we strive to provide our industry Training Customers with the very best training materials for their traning projects.

STI Electronics Inspection Kit

STI Electronics was awarded a 2015 NPI Award in the category of Training Materials for its J-STD-001 Inspection Kit. The NPI Awards Program is an annual celebration of produce excellence in electronics surface mount assembly. This training kit was designed by the Master IPC Trainers (MIT's) at STI Electronics to provide MITs and Certified IPC Trainers (CITs) with an easy way to administer the physical inspection requirements of Module 5 of the IPC-J-STD-001 training program. These materials can also be used for any other training programs by simply modifying the provided answer key.

Kit Contents:

- Instructional Videos
- Board Layout Form
- Student Terminal Inspection Worksheets
- Student PCA Inspection Worksheet
- Instruction Answer Keys
- (6) Printed Circuit Assembly (PCA) Samples
- (8) Soldered Terminal Samples

$400.00

Contact sales at

(800) 858-0604 or sales@stielectronicsinc.com

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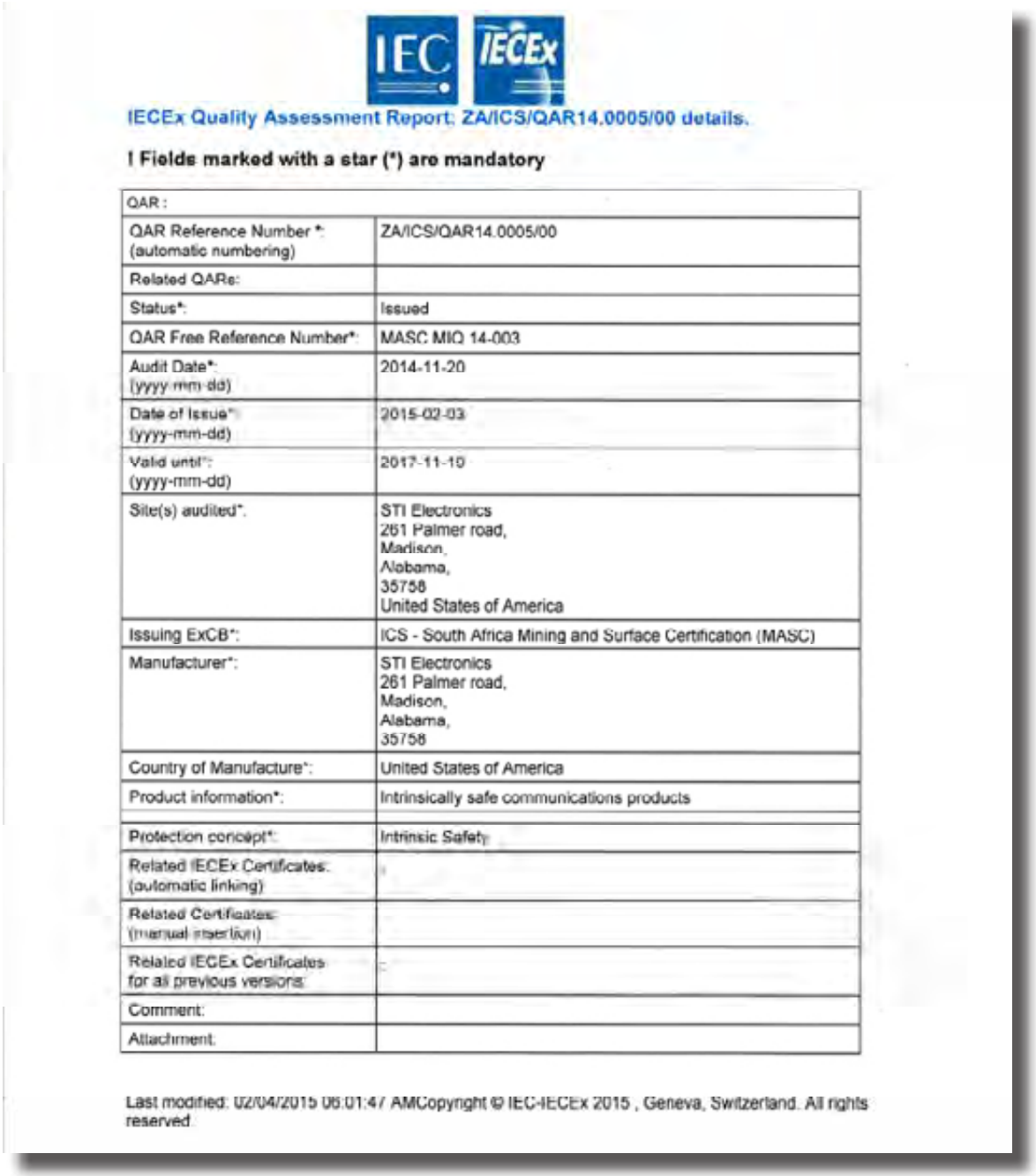
QUALITY MANAGEMENT SYSTEM

STI Electronics, Inc.'s (STI) Quality Management System (QMS) and facility have been audited to the requirements of ISO 9001-2008 and ISO/IEC 80079-34 for the manufacture and repair of intrinsically safe hardware. The audit was conducted by Mining And Surface Certification (MASC) an ExCB from the Republic of South Africa. MASC issued a Quality Assessment Report (QAR) showing that STI's QMS meets the requirements of both standards and is capable of manufacturing and/or repairing intrinsically safe hardware. The QAR has been posted as required to the International Electrotechnical Commission's (IEC's) website.



IECEx Quality Assessment Report: ZA/ICS/QAR14.0005/00 details.

! Fields marked with a star (*) are mandatory

QAR :	
QAR Reference Number *: (automatic numbering)	ZA/ICS/QAR14.0005/00
Related QARs:	
Status*:	Issued
QAR Free Reference Number*:	MASC MIQ 14-003
Audit Date*: (yyyy-mm-dd)	2014-11-20
Date of Issue*: (yyyy-mm-dd)	2015-02-03
Valid until*: (yyyy-mm-dd)	2017-11-19
Site(s) audited*:	STI Electronics 261 Palmer road, Madison, Alabama, 35758 United States of America
Issuing ExCB*:	ICS - South Africa Mining and Surface Certification (MASC)
Manufacturer*:	STI Electronics 261 Palmer road, Madison, Alabama, 35758
Country of Manufacture*:	United States of America
Product information*:	Intrinsically safe communications products
Protection concept*:	Intrinsic Safety
Related IECEx Certificates: (automatic linking)	
Related Certificates: (manual insertion)	
Related IECEx Certificates for all previous versions:	
Comment:	
Attachment:	

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EMPLOYEE HIGHLIGHT

Christy Hill

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Diana Bradford
Vice President/ Operations/Training Resources
dbradford@stielectronicsinc.com

What company can operate without great employees! Let me introduce you to one of our employees, Christy Hill. Christy began her career at STI in our accounting department and was responsible for Payables and Receivables. Some of you have probably spoken to her at one point over the past several years. More recently Christy has served in an Administrative Assistant roll helping with budget inputs, executing plans for employee lunches and celebrations, tradeshow coordination and maintenance and service contracts to name a few of her many and varied responsibilities. I am sure Christy would tell you it is never a dull day in the life of an Admin Assistant at STI. Christy has a unique personality and can find the humor in any situation which is always refreshing. Christy's brand of comic relief is much appreciated on what can sometimes turn into stressful days but the talent Christy brings to any situation thrown at her is also appreciated. Christy will soon celebrate her 10th anniversary at STI and we all hope there are many more to come. Thanks Christy for all you do!!

TRAINING SERVICES

Andy Mitchell

has joined STI as
Training Center Manager
for STI Electronics in Houston, TX

He has spent over 30 years in the field of Soldering Technology. Andy started out working in the Soldering Technology group at the China Lake Naval Weapons Center (now Naval Air Weapons Station China Lake) and followed Jim Raby when he started STI Electronics. He has worked as a Manufacturing and Quality Engineer at Lockheed Martin and was a Division Manager at American Hakko, a manufacturer of bench top tools for the electronics industry. He has trained well over a thousand operators, inspectors and engineers in high reliability soldering techniques in Asia, North and South America.

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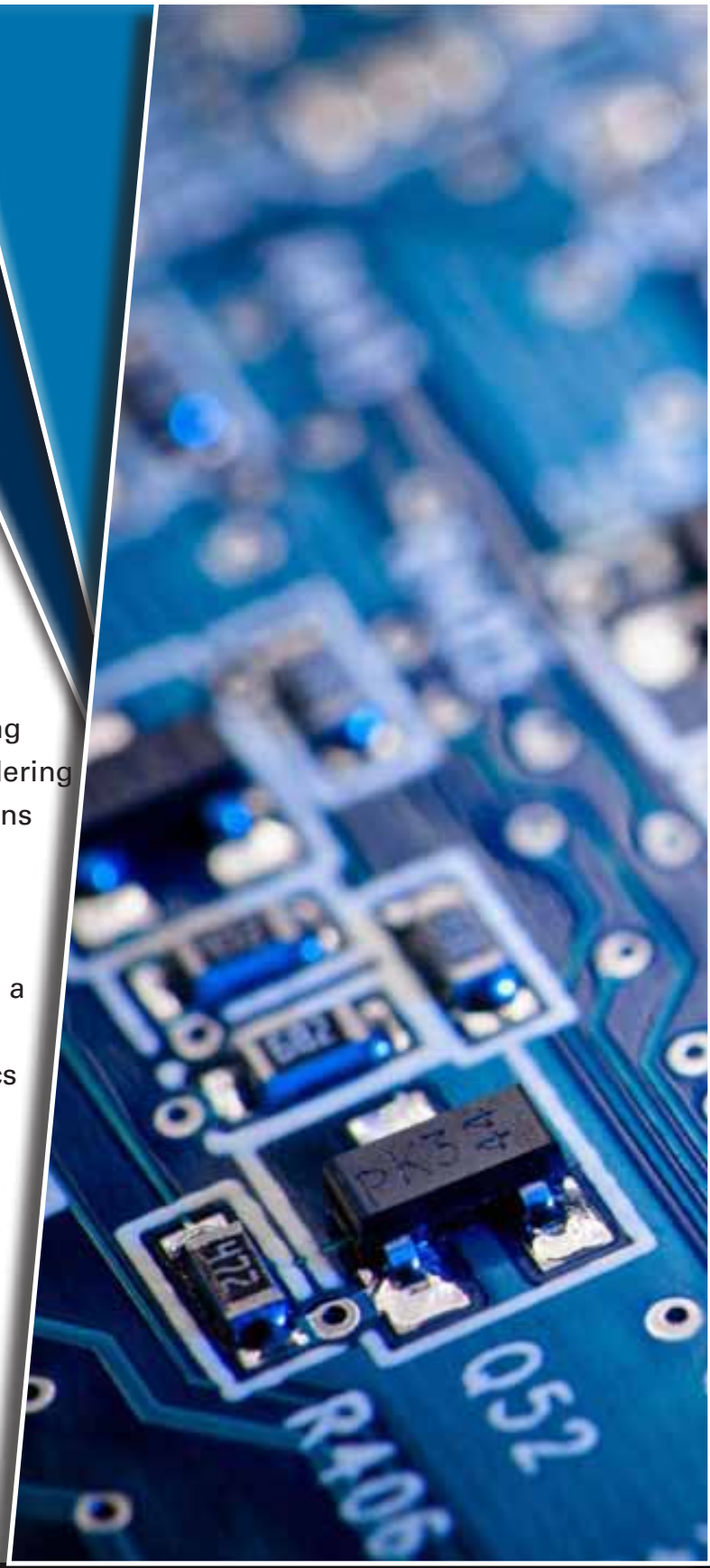

Patti Gander

has joined STI as
Center Manager
for STI Electronics
Florida Training Initiative

We are excited to announce the addition of Patti Gander to the STI Training Services staff. Patti is the Center Manager for our Florida Training Initiative. Patti possesses both an MBA and a Master of Management. She is a subject matter expert in a number of areas within the manufacturing and training industry. She has developed training curricula covering topics in Lean Manufacturing, Business Process Improvement, and Quality Best Practices as well as areas in project management, management and leadership development. Patti is a seasoned manufacturing veteran holding positions of Quality Manager, Operations Manager, Lean Implementation Manager, Plant Manager and Vice President of Operations. She is a Lean Six Sigma Black Belt and has been employed in both commercial and military manufacturing environments.

Patti has been an instructor in the manufacturing industry holding an MIT for J-STD-001, IPC-A-610, IPC-7711/7721 and IPC-WHMA-A-620. She is currently an adjunct instructor for the University of South Florida (USF) teaching courses in HR Management, Principles of Management, Organizational Assessment, etc. In addition, she was previously employed by the University of Phoenix as an adjunct instructor teaching courses in Foundations of Business, Supervision & Leadership, Organizational Theory and Critical Thinking.

Ms. Gander has served as a Florida State Sterling Examiner. She is a member of the Industry Advisory for the Florida Advanced Technology Education Group (FLATE) and actively participates in a variety of manufacturing advisory focus and research groups.

As you can see, Patti brings a lot to the table and allows further expansion of STI's course offerings supporting electronics manufacturing and industrial applications. **Contact Patti at (813) 486-1207 or pgander@stielectronicsinc.com** to discuss any of the classes below or to schedule dates for these classes to be brought to your facility.

Certified Production Technician
Mechanical Components 1
Industrial Electricity 1
Programmable Logic Controllers 1
Lean Six Sigma White Belt, Yellow Belt, Green Belt and Black Belt

- IPC-A-610 The Acceptability of Electronic Assembly
- IPC-J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies
- IPC-A-620 Acceptance of Cable and Wire Harness Assemblies
- IPC-7711/7721 Rework/Repair and Modification of Printed Boards and Electronic Assemblies
- IPC-A-600 Acceptability of Printed Circuit Boards

Darlene Hoffer

has joined STI as a
Master Instructor
for STI Electronics in Madison, AL

STI is happy to announce the addition of Darlene Hoffer as a Master Instructor, based out of our Madison, AL facility. Darlene has over 30 years of experience in electronics manufacturing and technical training and will be a tremendous asset to STI and the students who will have a chance to attend one of her classes. Darlene previously worked at DRS as a technical training specialist. She was responsible for training/certifying electronic assemblers and quality personnel IAW J-STD-001, IPC-A-610, IPC-7711/21 and IPC/WHMA-A-620 standards.

Darlene also worked for Crane Aerospace Electronics as an Assembler/Manufacturing Training Specialist. Her responsibilities included developing and conducting training IAW IPC-A-610, J-STD-001 standards as well as ESD Training. In addition she maintained certification/ recertification schedules. Darlene is currently certified as a Certified IPC Trainer (CIT) for IPC-A-610, J-STD-001, IPC/WHMA-A-620.

261 PALMER RD. | MADISON, AL 35758

We Are Giving You More Choices in Life.

Order Online

Now you can purchase any of our training kits and components including IPC materials at either of our e-store locations.

amazon.com

To Visit our NEW Amazon Store, go to:

http://sti-electronics-inc1.hostedbywebstore.com

or

http://estore.stielectronicsinc.com

TRAINING SERVICES

Contact Information:
Pat Scott
Director of Training Services
pscott@stielectronicsinc.com

Hopefully everyone is aware of IPC's Certification Quality Initiative (CQI) and the new online portal that allows for online reporting and online testing.

Here is an important date you should be aware of:

- **April 1, 2015 IPC will no longer support paper certificates**
- **All certificates will be issued through CQI and will be tracked through unique serial numbers**
- **Training Centers and CITs must use online exams/online certificate printing**

Remember the best place to get information from is the IPC Website at www.ipc.org. The knowledge tab will direct you to the Certification Quality Initiative (CQI) information. Here you will find the following:

- **CQI Overview**
- **Certification Portal**
- **User Guide, etc.**

If you go to the IPC Certfication Portal you will find a help tab that has the User Guide, Frequently Asked Questions (FAQ), and How To Videos. After reviewing this information, if you still have questions, you can contact IPC directly at certification.ipc.org. We are also available to answer any questions.

Now that the J-STD-001 training materials are available STI will be conducting the J-STD-001 courses to the F Revision starting in April.

The IPC-A-610F Training and Certification Course will be released on the following schedule:

- **The IPC-A-610F Materials for MIT to Certify CIT will be released April 3, 2015**
- **The IPC-A-610F Materials for CIT to Certify CIS will be released April 17, 2015**

Please keep us in mind for all your training needs.

Visit our website to view class schedules

www.stielectronicsinc.com

STI's Training Services

2015 Schedule

J-STD-001 "Requirements for Soldered Electrical and Electronic Assemblies"

J-STD-001 Certified IPC Trainer (CIT) Certification Course - Madison, AL

April 6-10
June 1-5
August 3-7
September 28-October 2
December 7-11

J-STD-001 Certified IPC Trainer (CIT) Recertification Course - Madison, AL

April 22-23
June 24-25
September 2-3
October 21-22
December 16-17

May 20-21
July 29-30
September 23-24
November 18-19

J-STD-001 Certified IPC Trainer (CIT) Space Addendum Course - Madison, AL

April 24
June 26
September 4
October 23
December 18

May 22
July 31
September 25
November 20

J-STD-001 Certified IPC Application Specialist (CIS) Certification Course (Modules 1-6) - Madison, AL

April 27-May 1

J-STD-001 Certified IPC Application Specialist (CIS) Recertification Course (Modules 1-6) - Madison, AL

September 9-11

IPC-A-610E "Acceptability of Electronic Assemblies"

IPC-A-610 Certified IPC Trainer (CIT) Certification Course - Madison, AL

April 27-30
July 13-16
December 14-17

June 1-4
October 5-8

IPC-A-610 Certified IPC Trainer (CIT) Recertification Course - Madison, AL

April 20-21
June 22-23
August 31-Sept 1
October 19-20
December 14-15

May 18-19
July 27-28
September 21-22
November 16-17

IPC-A-610 Certified IPC Application Specialist (CIS) Certification/Recertification Course - Madison, AL

July 7-9

MSFC/NASA-STD-8739.4 Cable Harness Certification Operator/Inspector

September 14-18

MSFC/NASA-STD-8739.1 Staking and Conformal Coating Operator/Inspector

August 31-September 3

Basic Soldering - Madison, AL

June 29-July 2

TRAINING SCHEDULE *cont.*

STI's Training Services

2015 Schedule

IPC/WHMA-A-620 "Requirements and Acceptance for Cable and Wire Harness Assemblies"

IPC/WHMA-A-620 Certified IPC Trainer (CIT) Certification Course - Madison, AL

May 11-14
August 17-20
December 1-4

IPC/WHMA-A-620 Certified IPC Trainer (CIT) Recertification Course - Madison, AL

April 2-3
May 28-29
June 10-11
September 10-11
October 26-27
November 12-13

IPC/WHMA-A-620 B Certified IPC Trainer (CIT) Space Addendum Course - Madison, AL
Prerequisite: IPC/WHMA-A-620B CIT Certification or Recertification Course.

April 6-10
June 22-26
August 24-28
November 16-20

IPC/WHMA-A-620 Certified IPC Application Specialist (CIS) Certification/Recertification Course - Madison, AL

May 27-29
October 28-30

IPC-7711/7721 Rework, "Modification and Repair of Electronic Assemblies"

IPC-7711/7721 "7721B Rework, "Modification and Repair of Electronic Assemblies"

IPC-7711/7721 Certified IPC Trainer (CIT) Certification Course - Madison, AL

July 20-24
November 2-6

IPC-7711/7721 Certified IPC Trainer (CIT) Recertification Course - Madison, AL

June 8-9
September 10-11
October 28-29

IPC-7711/7721 Certified IPC Application Specialist (CIS) Certification Course - Madison, AL

July 6-14
November 9-17

IPC-7711/7721 Certified IPC Application Specialist (CIS) Recertification Course - Madison, AL

November 2-3

IPC-A-600E "Acceptability of Printed Boards"

IPC-A-600 Certified IPC Trainer (CIT) Certification/Recertification Course - Madison, AL

June 29-July 1

To register for a class visit our website at www.stielectronicsinc.com

STI's Training Services Houston, TX

2015 Schedule

J-STD-001 "Requirements for Soldered Electrical and Electronic Assemblies"

J-STD-001 Certified IPC Trainer (CIT) Certification Course

May 4-8
August 17-21

J-STD-001 Certified IPC Trainer (CIT) Recertification Course

March 5-6
June 11-12
September 24-25
April 16-17
July 16-17
October 15-16

J-STD-001 Certified IPC Application Specialist (CIS) Certification Course (Modules 1-6)

April 6-10
September 14-18
July 6-10
November 2-6

J-STD-001 Certified IPC Application Specialist (CIS) Recertification Course (Modules 1-6)

July 13-15
October 12-14
September 21-23

IPC-A-610E "Acceptability of Electronic Assemblies"

IPC-A-610 Certified IPC Trainer (CIT) Certification Course

May 11-14
October 20-23
August 25-28
December 1-4

IPC-A-610 Certified IPC Trainer (CIT) Recertification Course

June 24-25
November 9-10

IPC-A-610 Certified IPC Application Specialist (CIS) Certification/Recertification Course

April 13-15
July 27-29
December 7-9
June 8-10
September 9-11

CCH-100 Crimping Course - 4 Hours

June 22
July 23
December 10
June 23
July 30

TRAINING SCHEDULE *cont.*

STI's Training Services Houston, TX

2015 Schedule

IPC/WHMA-A-620 "Requirements and Acceptance for Cable and Wire Harness Assemblies"

IPC/WHMA-A-620 Certified IPC Trainer (CIT) Certification Course

August 11-14 October 27-30

IPC/WHMA-A-620 Certified IPC Trainer (CIT) Recertification Course

October 15-16 November 12-13

IPC/WHMA-A-620 Certified IPC Application Specialist (CIS) Certification/Recertification Course

April 29-May 1 May 27-29
June 15-17 July 20-22
September 1-3 October 12-14

IPC-A-600E "Acceptability of Printed Boards"

IPC-A-600 Certified IPC Trainer (CIT) Certification/Recertification Course

Classes offered upon request

Basic Soldering

March 30-April 3 June 1-5
December 14-18

IPC-7711/7721 Rework, "Modification and Repair of Electronic Assemblies"

IPC-7711/7721 "7721B Rework, "Modification and Repair of Electronic Assemblies"

IPC-7711/7721 Certified IPC Trainer (CIT) Certification Course

May 18-22 November 16-20

IPC-7711/7721 Certified IPC Application Specialist (CIS) Certification Course

April 20-28

Address
Beltway 8 Office Center
9920 W. Sam Houston Parkway S., Suite 420
Houston, TX 77099

To register for a class visit our website at www.stielectronicsinc.com


sti
electronics
wishes you and your family a
Happy Easter