NEWS

Volume 12 • Issue 8 • May, 2014

sti electronics inc.®

Leading the way in electronics

DAVE'S WORLD

By: Dave Raby

May 2014

Thank you to those of you who came out to our Houston Open House. It was great to see everyone and to show off the new training facility. We had great food which I successfully avoided most of the day but at the end it may have gotten ugly. Our business continues to grow in the area and hopefully you'll see us adding another instructor soon.

A few months ago, I mentioned some young folks from the University of Alabama in Huntsville that as a class project were building a satellite to be put in orbit. The guys we were working with have all finished their Master's Degrees and have now started their own company (RadioBro). I'm happy to say STI will be continuing our relationship with them as they will be moving into our building and using office and lab space as well as our manufacturing area as they build commercial radio communication systems for use in satellites. I'm really looking forward to watching their company grow. Also, if you are launching a satellite and have an interest in communicating with it, we can hook you up.

We also just finished our 3rd semester of hosting an intern from the Bob Jones High School Engineering Academy. This is a great program that gives promising engineering students a chance to get some hands on experience in engineering. Most of the students know they want to be an engineer but in many cases have no idea whether that's electrical, mechanical, chemical, etc… and this gives them a chance to hopefully find out or at least eliminate a possibility or two before they get to college. It is great for the young people involved but it is also great for STI and for all of our future. The young men and women we see from the program do give me a good feeling about the quality of our future engineers and people. I really hope we can one day hire one or more of the ones that have gone through STI.

Most of you know Diana Bradford who is our Vice President of Operations and Training Resources. While that's her title, in reality she is much more than that. I've known Diana for 25+ years and don't know what I would do without her. She has a birthday coming up this week. I'm too polite to talk about a woman's age but this isn't a normal birthday, this is a big one. She's planning to celebrate by going to Disney World with 15 of her closest friends and I hope she has a great time but still manages to get plenty of rest. (Did I mention it is a BIG birthday?) If you get a chance, please send her a "Happy Birthday" or "You Don't Look A Day over 75" message to dbradford@stielectronicsinc.com. Hopefully, her phone is set on a big font and she'll be able to read it.

As always, if there is anything we can do to serve you better, please let us know. You can contact me or anyone else listed anywhere in this newsletter.

Please follow us on twitter (@daveraby) or facebook (STI Electronics) for more up to date STI information.

Contact Information:
Dave Raby
President/CEO
draby@stielectronicsinc.com

Contact Information:
Mark McMeen
VP of Engineering/Manufacturing
mmcmeen@stielectronicsinc.com

MICROELECTRONICS: Rewiring the Future

STI Microelectronics Lab and Analytical lab have been assisting customers on a sweeping change that is silently moving through the industry and most companies are not even aware of the changes inside their integrated circuits (IC's).

The change is a big money saver for the component supplier and the packaging facility. Did you receive the change notice? Did you receive the reliability studies? Did you get an end of life notice? And last but not least did you get a phase in or transition plan? If you are a large customer and have special requirements or high volumes then you may have been advised but even the big boys did not get notices on all product lines and affected integrated components (IC's). What is this sweeping change? Copper wire bonds are being integrated into commercial and industrial IC's at an incredible conversion rate.

What is the significance and importance with such a change and why am I concerned? Integrated circuits and its wire bond material set has not changed since its inception in the early 1960's and for over 50 years the attachment method and high volume choice has been the gold ball wire bond technique. The learning curve and the machine processing parameters have been unchanged for 50 plus years and the physics behind the process has been very well understood as well as the process controls behind making a reliable wire bond. The following article outlines the challenges and the unknowns of copper wire bonding and why we need to embrace the change and educate ourselves on copper wire bonding because the economics for using copper wire bonds is driving this revolution. Fifty years of reliability data and billions / trillions of parts from the 1960's to today have given us the benchmark for future evaluations of copper wire bonds. Again this is not to say we are against copper wire bonds but to say we all need to understand the risks and challenges facing this new technology and the lack of reliability data. Lead free soldering was a mandated change that had transition and phase in periods which allowed companies to beta test, field product and evaluate reliability over a period of time and convince themselves that their products and warranty expectations could be managed and understood. Copper wire bonding has been migrating into the IC market over the last 6 years with little fanfare and slowly migrating into the medium to higher I/O devices and cost points the last couple of years. So the answer is "embrace" the change and "mitigate" the risk by understanding the challenges of using copper wire bonds and mitigating the risk inside your electronic assemblies.

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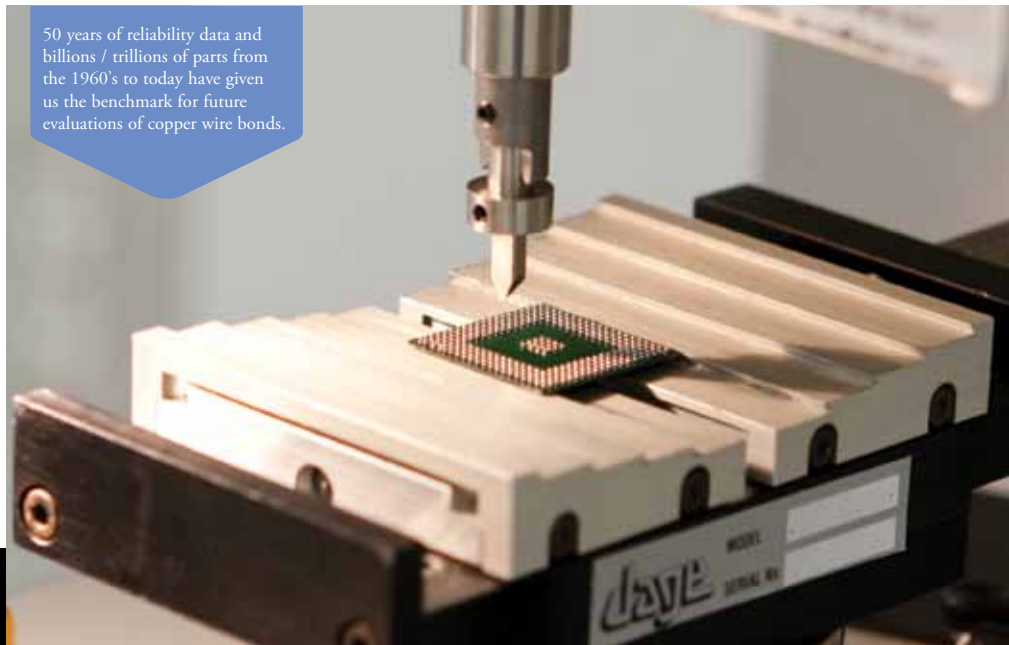
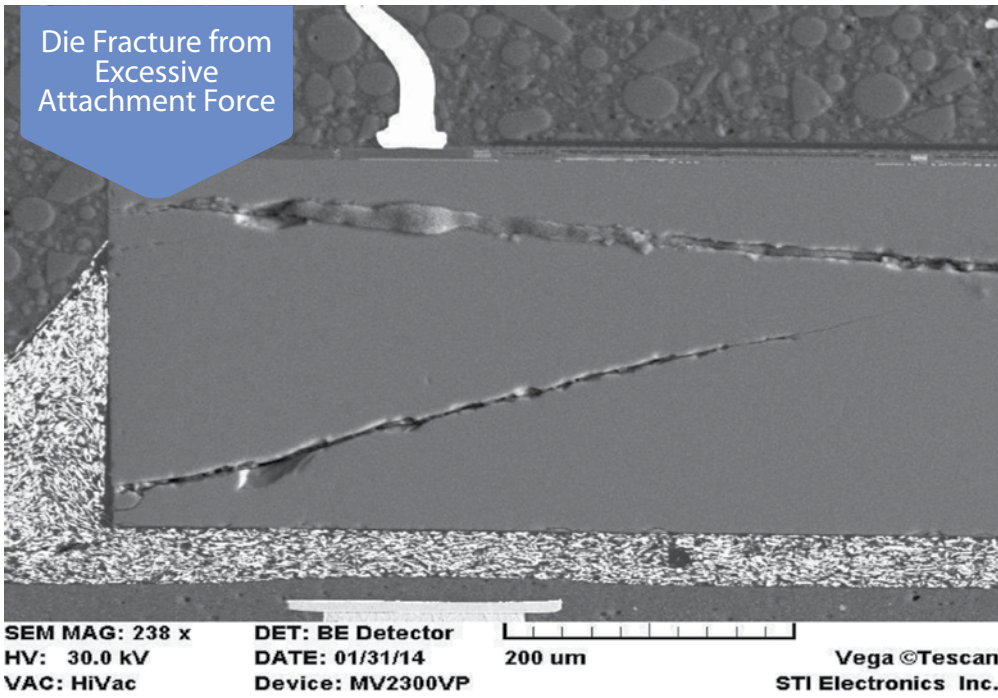


50 years of reliability data and billions / trillions of parts from the 1960's to today have given us the benchmark for future evaluations of copper wire bonds.

Copper wire bond economics are driving this change as evidenced by the material cost savings realized on a per IC device standpoint. Gold raw material cost is $1200 to $1800 per ounce as compared to copper raw material at 31 cents per ounce. The cost perspective for a gram of copper is 7 tenths of 1 cent as compared to gold at $40.32 per gram. A standard 48 pin IC device cost comparison for gold vs. copper wire bonds in an assembled package is 12 to 15 cents for gold vs. 8 to 10 cents for copper. Where did all the cost savings go? This is the rest of the story and why one should understand the advantages and disadvantages of copper wire bonding vs. gold ball bonding.



History and migration of copper wire bonding started approximately 2006. See the following introduction of copper wire into devices:

2006 low volume trials on devices with I/Os below 32

2008 /2009 low volume trials on devices with I/Os greater than 32 but less than 64

2010 to 2013 low volume ramping to higher volumes with devices greater than 64 I/Os

This shows a transition to copper wire bonds over a 6 to 7 year time period. When did you become advised of copper wire bonds in your IC's?

The real measure of market penetration is the sales of

History and migration of copper wire bonding started approximately 2006.

equipment with forming gas kits which are required for copper wire bonding and/or conversion kits for existing wire bond machines to allow the use of copper materials as wire bonds. The following estimated shipments of forming gas kits allows an insight into the market penetration for copper wire bond IC's. Wire bond equipment sales with forming gas kits or conversion gas kit is the real measuring point for market penetration.

COPPER WIRE BOND CAPABLE MACHINES IN THE MARKET PLACE

Estimated percentages are by looking at equipment sales with forming gas kits on year over year basis.

1. 2007 – est. 1 to 2%
2. 2009 – est. 5 to 6%
3. 2011 – est. 15 to 17%
4. 2013 – est. 25 to 30%
5. 2016 – est. 70% plus

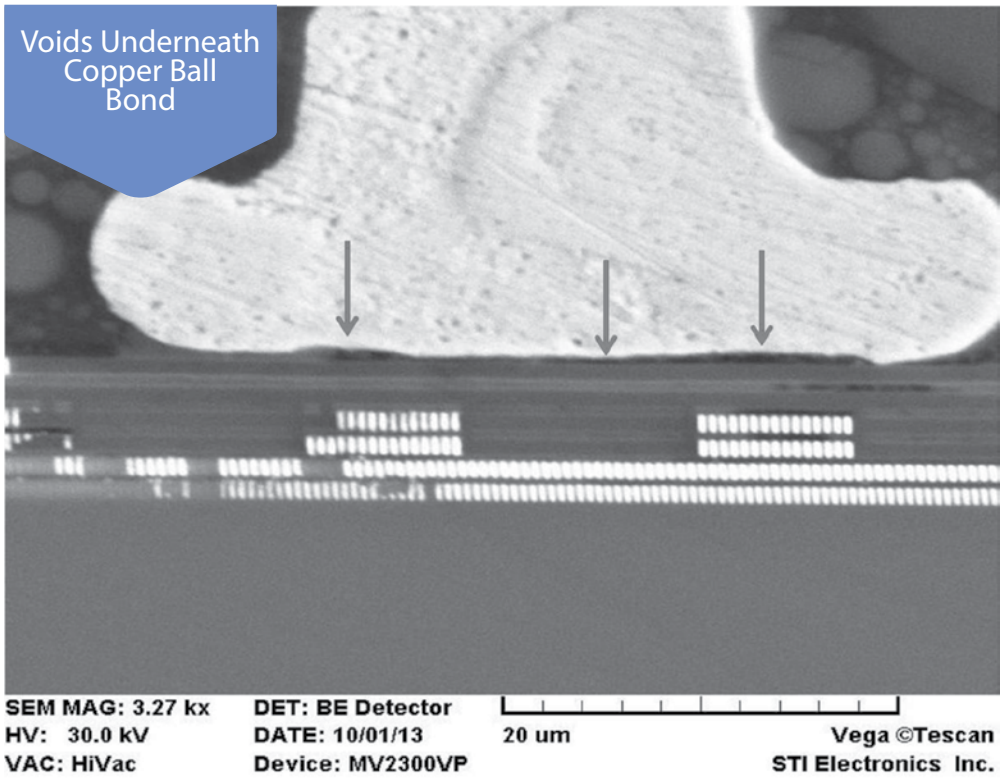
The real challenges for converting to copper wire bonds are also the issues we must be concerned

with from a reliability and warranty standpoint. Are the IC devices as reliable long term as the historical and proven gold ball bonding wire process? What should we be aware of and what can be done to assess or mitigate the risk of transitioning to copper wire bond IC's in our electronic assemblies and systems? The three early challenges to even make copper wire bondable or feasible is ball formation, copper oxidation and process control verification. These three things must be understood and controlled to be able to use copper as a wire bondable material.

1. Copper oxidation affects wire bond adhesion
2. Ball formation affects wire bond shape and adhesion
3. Process control – ultrasonic energy and force affects wire bond adhesion

To best address these challenges the wire bond industry started in 2000 / 2001 timeframe addressing these challenges by using forming gas and controlled flame off temperatures to address each of these challenges. As gold prices went up and margins became smaller, industry needed a low cost material and the process controls to allow copper to become the industry solution to a growing economic / cost issue with gold wire bonds. Thus the migration and revolution to a new wire connect material for integrated circuits began.

What are the advantages of copper wire bonding?



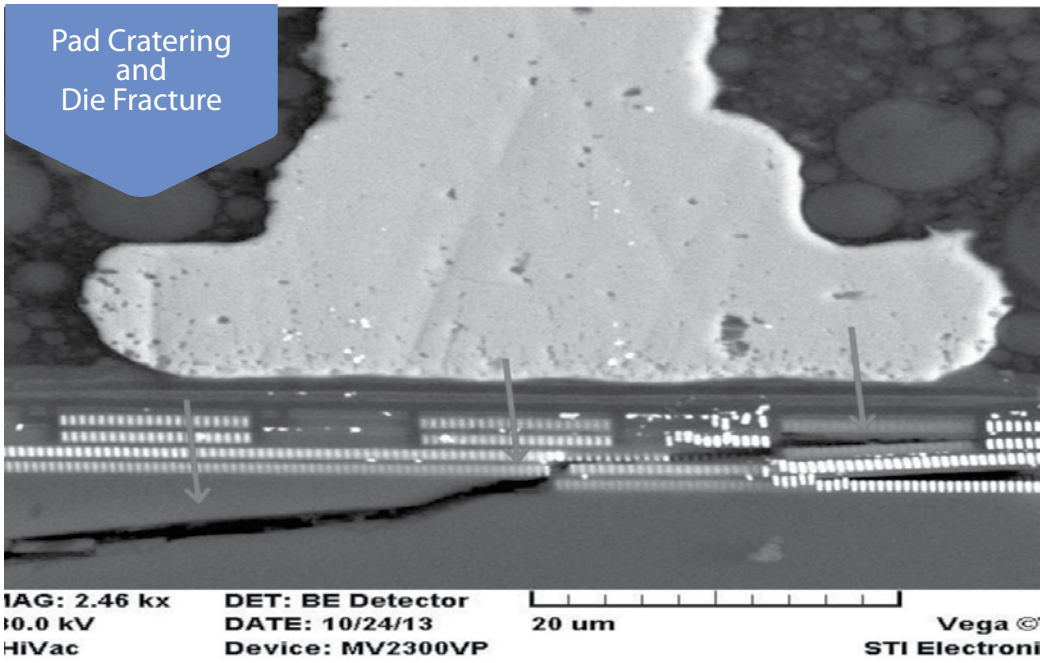
1. Cost savings number one = lower cost per interconnect
2. Stiffer loop = addresses loop sway on fine pitch I/O pads
3. High temperature stability = can be used in high temp environments
4. Lower copper / aluminum intermetallic growth = minimizes intermetallic brittleness
5. Higher current carrying capability = smaller diameter wire = .6 mil diameter possibility
6. Higher wire bond attachment strength

What are the disadvantages of copper wire bonding?

1. Copper oxidation = copper oxidation impedes wire bond attachment
2. More capital equipment needed because the process speed per wire bond is slower and yields are lower by 10 to 30% than gold bonding (This is the major economic driver on why there is not a larger cost savings per device)
3. Tight process window = cover gas and flame off temperature is critical (Process speed is slower because of cover and forming gas)
4. Aluminum Splash = copper wire bonds require higher ultrasonic forces and thus aluminum pad plating displacement is greater than with gold ball bonding
5. Ball formation is more difficult – shape and size repeatability is

difficult

6. Overmold compounds are corrosive to copper wire bonds = new overmold materials being developed
7. First article and process verification is more difficult and thus process control is a challenge
8. Yield impact
9. Pad damage due to excess force or aluminum scrub action
10. Pad cratering is difficult to see from topical microscope angles



All of these disadvantages are challenges but overtime they will become managed and controlled as the industry developed tools and processes to better address each short coming. In the mean time, each company needs to understand and be aware of these challenges and assess how best to manage their warranty objectives and expectations as the transition to copper wire bonds goes mainstream. As mentioned earlier, embrace the changes to copper wire bond IC's and mitigate the risk by evaluating and understanding the reliability of these IC's in your electronic assemblies. Cost savings today is in the 30 % range but the upside is great for the packaging industry with copper wire bonds because as they address and overcome the major challenges then more margin and cost savings will be realized. Just image if they could improve yields to match gold ball bonding on yields and production speeds then the cost savings would double from today's savings plus the gain in production capacity. This would lead to lower pricing per IC package. Again the reason to embrace change while mitigating risk is the economic driver in the packaging industry (margin gains) with the ability to pass on lower cost IC devices to the end user and increase their margin at the same time. The contract assembler needs to manage the risks of reliability expectations while the industry transitions to this new interconnect technology. Only time will tell if changing to copper interconnects affects 3, 5, 7 or even 15 year warranty expectations and reliability experience ratings. Historical data will come as more IC's convert to copper wire bonds and the industry monitors warranty information and returns. The real test is in the long term industrial markets where warranty expectations can go out over 10 to 20 years and in the military and aerospace industries that have long useful life expectations.

Please call or email

Mark McMeen, mmcmeen@stielectronicsinc.com or

256-705-5515

if you have any questions or comments concerning "Rewiring the Future".

TRAINING MATERIALS

Terminal Boards, Mounted

Contact Information:
Mel Parrish
FSO, Director Training Materials
mparrish@stielectronicsinc.com

Terminal attachments have been around for a very long time to accomplish electrical connections.

Historically, our standards have required routing techniques and stress relief to eliminate known failure mechanisms. The need to train operators on how to apply these provisions has been around for the same period and was addressed initially through Military "High Reliability" solder training programs. NASA also incorporated training for these terminal attachment techniques.

STI offers Mounted Terminal Training Kits that allow operators to practice the standard requirements in a training environment. For the most part, NASA training resources have used this product but the principles would be good to add for anyone who needs this type of attachment in production.

The STI Mounted Terminal Kit includes a 125 mil board with either Turret or Bifurcate terminals swaged in place. This allows the operator to attach either components or wires observing stress relief, continuation of wrap, wrap direction and length. It also allows training on correct continuous wrap terminal to terminal. Soldering techniques and skills are also enhanced.

Mention this newsletter article during the release month and receive a

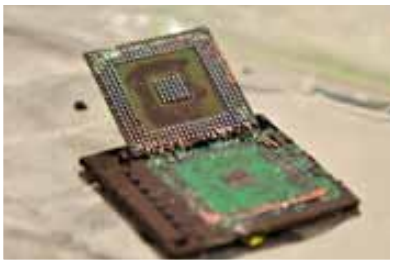
10% Discount

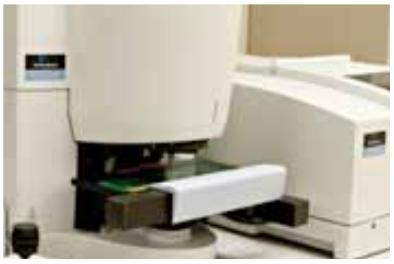
from list price for either the Turret or Bifurcate Mounted Terminal Boards.

Your choice, but both would be a good training enhancement for operator skill.

ENGINEERING SERVICES

STI's involvement in research and development programs, both in component packaging technologies and electronics assembly manufacturing, has brought about the installation of the latest and most advanced equipment and the acquisition of the top people in this field.





STI is staffed to design, develop, assemble, and test a ruggedized electronics assembly in an advanced cleanroom laboratory (Class 1000/ISO Class 6 certified) to meet our customer's specifications.

Manufacturing
STI Electronics' manufacturing lab encompasses 26,000 sq ft of floor space containing two surface mount lines, automated through-hole processing, and multiple flexible work cells for final assembly, 7711/7721 certified rework and repair, box build, and test. The facility and equipment is complimented by a highly skilled and trained work force of electronic technicians and associates, all of whom are certified to the highest standard of IPC J-STD-001 ES (Space Addendum).

THE ANALYTICAL EQUIPMENT INCLUDES SOME OF THE INDUSTRY'S NEWEST AND MOST ADVANCED TOOLS.

Material Failure Analysis
STI's Analytical Laboratory's enhanced capabilities are the result of the recent addition of several new analytical tools and equipment.

Microelectronics Packaging
The Microelectronics Lab was established to meet the rising need for advanced systems development and packaging to address the emerging challenges and issues facing today's electronics assemblies. Advanced design and modeling software enables STI to design and develop highly integrated hardware to meet shrinking form and fit factor requirements as well as increasing thermal loads. Emerging packaging materials are continuously evaluated to optimize electrical and thermal performance. The microelectronics lab specializes in state-of-the-art packaging design and assembly including current technologies such as Chip-On-Board (COB) and Multichip Module (MCM) as well as emerging technologies such as STI's patented packaging technology termed Imbedded Component/Die Technology (IC/DT®).

Circuit Design
STI's involvement in research and development programs, both in component packaging technologies and electronics assembly manufacturing, has brought about the acquisition of the top people in this field and the installation of the latest and most advanced equipment and design tools. STI is US-based, ITAR registered, and staffed with engineers to design, develop, and assemble a ruggedized electronics assembly in compliance with our customer's specifications. With experience in Defense, Aerospace, Space, and commercial applications, STI is adept to designing and assembling a product to satisfy our customer's requirements.

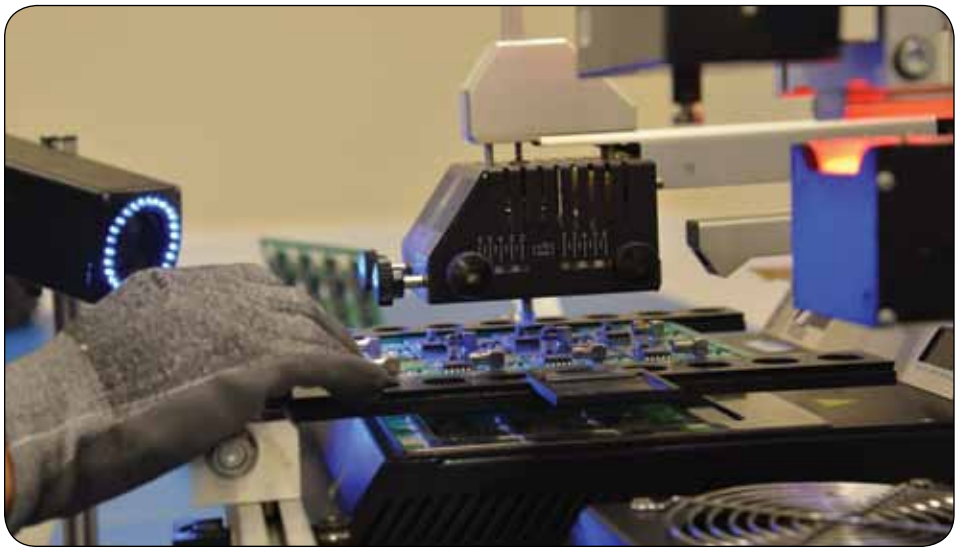
ENGINEERING SERVICES Cont.

ELECTRICAL TEST SERVICES

STI offers a variety of electrical test services from component-level testing/characterization to system-level testing. Electrical testing is offered to validate values in accordance with component manufacturer's performance specifications, a customer's test specification, as well as standard test methods.

- Analog and Digital Designs
- High Frequency RF Layouts
- Controlled Impedance Designs
  - Design Attributes
  - Rules Management
- Design Library Generation
  - Part, Package, and Electrical Symbols
  - Full Forward/Back Annotation

- Thermal Shock
  - Temperature Cycling
  - Moisture Resistance
  - Humidity Cycling
  - Shelf Life
  - Accelerated Aging
  - Vibration Testing
  - Mechanical Shock Testing



STI Electronics Inc.'s Engineering Department serves the aerospace, military, and commercial sectors of the electronics industry offering test and evaluation services for component-level and system-level electronics hardware. STI offers customized test protocols as well as performs testing in compliance with various EIA/JEDEC, IEC, AEC, ASTM, IPC, and MIL standards.

ENVIRONMENTAL TEST SERVICES

All electronic hardware is susceptible to the damaging effects of moisture, temperature, and contaminants. STI understands the criticality of reliability testing and test-to-failure. Improper selection of assembly materials and manufacturing processes can result in field failure returns which can lead to high warranty reserves thus affecting long-term profitability. STI's environmental testing capabilities include replicating environments such as Humidity/Moisture Resistance, Thermal Shock/ Thermal Cycle, Steam Aging and Vibration/ Shock testing. Coupled with the ability to perform in-situ electrical testing as well as a full range of post-test analysis of samples, these tools allow for rapid "aging" of components and prediction of operational life of hardware.

ELECTRONIC ASSEMBLY

STI Electronics, Inc. is one of the largest stocking distributors in the USA. STI is located in Madison, AL with sales staff covering the entire Southeast. STI's friendly Inside Sales Team in conjunction with our Outside Sales Staff work hand in hand to make sure the customer receives the technical support necessary to make informed purchase decisions at the best prices possible.

PRODUCTS

3M	Fancort	Panavise
3M ESD	General Tools	Plato Products
ACL Staticide	Gordon Brush	Production Basics
AIM	Hakko	Puritan
American Beauty	Hunter Products	QRP
APEX	Ideal	R & R Lotion
ASG	Identco	Scienscope
Aven	Janpak	Simco
Beautech	JBC	Static Tech
Bio-Fit	Jensen Global	Steinel
Bonkote	Kahnetics	Swanstrom Tools
Botron	Kester	Tech Spray
Brady	Lewis Bins	Tech Wear
Chemtronics	Liberty Packaging	Technibilt
Conductive Containers, Inc.	Lindstrom	Utica
Creative Global Solutions	Lista	Virtual Industries
Dantona	Lufkin	Weller
DEK	Luxo Lighting	WIHA
Easy Braid	LW Scientific	Wire Wrap
Edsyn	Metcal	Wiss
Erem	Micro-Care	Xcelite
Excelta	Nicholson	
	O.C. White	
	Pace	

Phone: 800-858-0604
Fax: 888-650-3006

E-STORE

For the convenience of our customers, all products available at STI can be purchased from our E-Store accessible at **www.stielectronicsinc.com**

AVEN

15 Up to FPS
Frame/ second

Wi-Fi
Mobile Hotspot

1x~ 80x
Zoom range

ANDROID APP ON Google play

Download on the App Store

Mighty Scope Connect

Connect to your iOS or Android device

The Mighty Scope Connect is great for medical offices, education, mobile research, science, quality control, law enforcement (counterfeit ID, crime lab, etc), hobbies and collecting (coin, stamp, watch, jewelry, etc.), entertainment and much more.

Features

- **Handheld wireless digital microscope, 6 white LED's with variable lighting control**
- **Adjustable magnification from 1x–80x (varies based on monitor)**
- **High quality lens for undistorted, true to life images**
- **Active Pixel Technology produces sharp images and accurate color reproduction**
- **Android (2.3 and up) and iOS (4.1 and up) compatible**
- **Connect multiple devices with wireless hotspot technology**
- **Microtouch Shutter button for remote image capture**
- **Includes an adjustable metal stand, 3 rechargeable AA batteries (Ni-MH batteries) and battery charger**

Part #	Description	Price
26700-201	**Mighty Scope Connect**	**$395.00**

Specifications

MIGHTY SCOPE CONNECT	
IMAGE SENSOR	1/4" Color CMOS
EFFECTIVE PIXELS	0.3M
LED LIGHT TYPE	Adjustable 6 White LEDs
MAGNIFICATION	1X~80X (Viewed on 9.7 iPad) **Magnification varies with monitor size*
SNAP SHOT MODE	Hardware & Software controllable
GAIN CONTROL	Auto Gain Control
WHITE BALANCE	Automatic
VIDEO CODEC	MPEG4
WI-FI COMPATIBILITY	2.4GHz Wi-Fi IEEE802.11b/g/n
OPERATIONAL RANGE	~10M from connected device
O/S	iOS 4.1 and up | Android 2.3 and up
POWER SOURCE	3 AA (Alkaline, Ni-MH) batteries
POWER CONSUMPTION	3.6V | 440mA
OPERATION TIME	~3.5 hours with Ni-MH 2500mA batteries **Time will vary depending on environment*
OUTER DIMENSIONS	155mm x 75mm x 37mm
WEIGHT	140g (w/o batteries)

STI's J-STD-001 Inspection Kit

Part No. STI-INSP-001-E1

This training kit was designed by the Master IPC Trainers (MIT's) at STI Electronics to assist 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 other training programs that reference the IPC J-STD-001 Criteria.

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

Kit Contents:

- DVD
  - Instructional Video
  - Board Layout Form
  - Student Terminal Inspection Worksheets
  - Student PCA Inpsection Worksheet
  - Instructor Answer Keys
- Encapsulated Inspection Samples
  - (6) Printed Circuit Assembly (PCA) Samples
  - (8) Soldered Terminal Samples

Cost: $400.00

To place an order contact sales at (800) 858-0604 or sales@stielectronicsinc.com.

261 Palmer Road • Madison, AL 35758 • (800) 858-0604 • Fax 888) 650-3006

www.stielectronicsinc.com

2014 Schedule

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

IPC J-STD-001 Training Center

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

June 2-6	August 11-15
December 1-5	

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

June 25-26	July 30-31
August 27-28	September 24-25
October 29-30	November 19-20

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

June 27	August 1 & 29
September 26	October 31
November 21	

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

June 23-27	Sept. 29 - Oct. 3

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

IPC/WHMA-A-620 Training Center

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

June 9-12	August 18-21
December 8-11	

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

June 23-24	July 28-29
August 25-26	September 22-23
October 27-28	November 17-18

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

July 30-Aug 1	November 12-14

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

IPC-A-600 Training Center

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

October 15-17

261 Palmer Road, Madison, AL 35758 • (800) 767-4919 • Fax (256) 705-5538

2014 Schedule

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

IPC/WHMA-A-620 Training Center

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

July 8-11 October 20-23

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

June 30-July 1 September 11-12
October 15-16

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

July 14-18 September 15-19

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

IPC-7711/7721 Training Center

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

July 21-25 October 6-10

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

IPC-7711/7721 Training Center

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

July 28-29 September 4-5
November 13-14

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

August 11-19 December 8-16

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

December 17-18

Basic Soldering - Madison, AL

Available upon request.

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

November 3-6

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

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www.stielectronicsinc.com

2014 Houston, Texas Schedule

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

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

July 7-11 November 3-7
December 1-5

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

November 19-20

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

November 14

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

August 4-8

J-STD-001 Certified IPC Application Specialist (CIS) Recertification Course (Modules 1-5)

October 13-14 November 17-18

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

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

July 21-24

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

August 14-15 November 10-11
December 8-10

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

June 11-13 August 11-13

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

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

June 16-19 September 2-5

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

July 17-18 November 12-13
December 11-12

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2014 Houston, Texas Schedule

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

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

July 14-16

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

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

September 15-19

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

June 9-10

Basic Soldering

June 2-6 September 8-12

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

Please note that additional course dates can be added to the schedule upon request.
Contact Pat Scott
Director of Training Services at:

pscott@stielectronicsinc.com
256-705-(Desk) or 256-527-6758 (Cell)

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

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