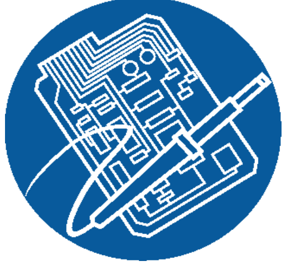
Volume 1, Issue 4

June 2002

The Target Connection

Fourth Edition: Look for issues bi-monthly



Special points of interest:

- Workforce Development - Is Certification Enough?
- Training Material Department—Special Offer
- STI Features Contract Engineering Services Division
- Sales Department Features PACE's TW-100
- Surplus Inventory Sale
- Jim's Corner

To Register for classes call
(256) 705-5512
or
(800) 858-0604

Training Calendar

J-STD-001 Registered Instructor Certification
August 5-9

J-STD-001 Registered Instructor Recertification
August 21-22

J-STD-001 Operator Proficiency Certification
July 22-26

MSFC/NASA Solder Certification
July 15-19

MSFC/NASA Staking and Conformal Coating Certification
June 24-27

MSFC/NASA Cable and Harness Certification
August 12-16

IPC-7711/21 Rework & Repair Registered Instructor Course
July 15-19

IPC-A-610 Instructor Certification
July 8-12

IPC-A-610 Instructor Recertification
August 19-20

Soldering Technology International, Inc. (STI)

Work Force Development — Is Certification Enough??

How do you know if the certification program so popular today is all that your people need to be successful in their work environment? The concept of certification is an excellent one since it establishes effective training at a reduced cost to an established proficiency level. It creates traceablity for the certified person to an authority such as an association or committee (i.e. IPC Certification Committee). However, to say that certification works in all cases is like saying everyone should drive the same car.

When we bring an employee into the work place, we often need to look beyond the initial certification to determine if the individual can perform the actual tasks to meet our expectations. The advantage with a certified employee is that we can begin our evaluation at a common point knowing that they are at least as good as the certification program that they attended. In some cases they may even exceed our requirement for simple tasks, and in other more complex tasks they may need additional specialized training.

STI can create Workforce Development profiles using tools that define the skills and knowledge people need to be proficient in their occupations. Modular training approaches that create solutions are also available and can be modified as necessary to meet individual company applications. Assessments are also available to determine the individual performance in basic knowledge (i.e. math) all the way through to specialized skill applications (i.e. precision optical assembly).

Certification is a tool but if the workforce is going to be effective and efficient, specialized training or skills assessment maybe required.

For more information on workforce development contact Mel Parrish at (256) 705-5530 or e-mail at mparrish@solderingtech.com.

STI's Training Materials Department — Special Offer 35% Off

Dummy components offer the opportunity to conduct process qualification and training without the cost or inventory issues of functional components. For a limited time we are offering these components at a reduced price. It may be an excellent time to stock up on these popular components for your training and process development needs. Please call **(256) 461-9191 or 1-800-858-0604** to receive a catalog of our complete component listing and ask for Sales (offer #113). One of our friendly customer service representatives will be glad to help you with your order or answer any questions that you may have. Quantities are limited so don't delay!

1206 Resistors
BQFP 132 (20 X 20)
LQFP-44
QPF 64 (14 X20) (40 mil pitch)
SOLIC 18 (.300 X .456)
TSOP 32 (8 X 20) (20 mil pitch)
BGA 388 (35 X 35)

BQFP 100 (23 X 23)
DD-PAK
QFP 208 (28 X 28) (20 mil pitch)
SOLIC 16 (.300 X .407)
SOLIC 20 (.300 X .505)
BGA 272 (27 X 27)

STI² Features the Contract Engineering Services Division

STI[2] is a division of Soldering Technology International that focuses on ***Engineering Services and Advanced Technologies.*** Of the departments in this division, Contract Engineering Services specializes in solution development for process and manufacturing related issues from the component to fully integrated system levels. This flexibility, along with the ability to work on both short and long term projects, as well as an extensive technical knowledge base has allowed for the successful completion of cutting edge technical projects. Coupled with the capabilities of other departments in this division (Analytical Lab, Prototype & Development Lab, and Rework / Repair Solutions), STI[2] is positioned to help our customers address & find solutions to the wide range of technical challenges facing the electronics assembly industry today.

If you have questions or would like further information regarding any of the STI[2] departments, please contact Mark McMeen at 256-705-5515 or e-mail at mmcmeen@solderingtech.com.

Common Pitfalls in Micro BGA's

By: Jason Gjesvold

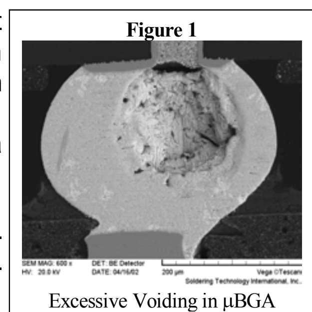


Figure 1

Excessive Voiding in μBGA

As packaging trends continue to miniaturize component size and circuit pitch in an effort to increase signal density and speed, problems that were once within the design margin of an assembly process begin to emerge. For example, voiding while relatively common in ball grid arrays, becomes an increasingly significant problem when coupled with shrinking ball sizes. As illustrated in Figure 1, voids in micro-BGA balls can become a significant percentage of the ball volume when compared to voids in standard BGA balls. This creates an inferior ball structure, which has less mechanical strength than a normal ball and is more susceptible to crack initiation / propagation during thermal and mechanical stress application. Compounding this effect is the use of "via in pad" to accommodate for higher circuit densities. If vias are not plugged, solder will wick into the via. This will potentially deplete enough solder from the ball that the remainder of the ball will not make contact with the pad. Hence, the probability of an open circuit increases dramatically. Conversely, while filler material can be used to plug vias, if not properly cured, the filler material will outgas at reflow temperatures and can contribute significantly to the voiding of the ball.

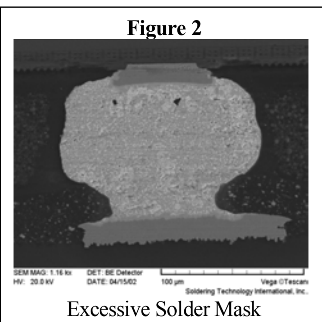


Figure 2

Excessive Solder Mask

As flip-chip devices become increasingly incorporated onto micro-BGA interposers, the flip chip interface must also be studied and understood. Mis-registration of solder mask along with excessive solder mask greatly inhibits the integrity of the flip-chip interface. As seen in Figure 2, it is not uncommon to mask too much of the pad, leading to a "mushroom" shaped flip-chip ball. This will degrade long-term reliability and potentially introduce latent or intermittent failure modes.

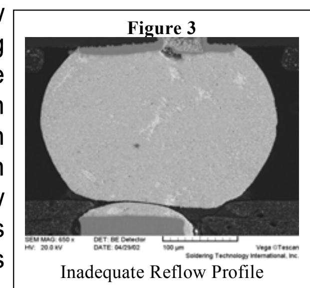


Figure 3

Inadequate Reflow Profile

Finally, the thermal characteristics of the device under reflow must be accommodated for. For instance, in devices utilizing high thermal resistive interposers, the correct thermal profile for a standard package may not be adequate. As seen in Figure 3, if balls close to the center of the package only reach stage one reflow temperatures (365° – 400° F), proper wetting will not occur and an open circuit will result. This underscores the importance of sufficient heat in the thermal reflow profile. In conclusion, as miniaturization is increasingly infused into standard electronics packaging techniques, more awareness is needed to ensure that assembly processes are adequate to prevent the occurrence of such common defects.

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Trade Show Schedule

SMTA Assemby Technology Expo ▪ Rosemont, IL ▪ September 24-26, 2002 ▪ Booth 51031

NEPCON WEST 2002 ▪ San Jose, CA. ▪ December 4-6 ▪ Booth 1805

STI's Sales Department features PACE's TempWise™ (TW 100) Advanced Soldering

PACE's TempWise™ TW 100 with InstaCal™ offers you the option of Unsurpassed Temperature Accuracy, Specification Conformance and Verification.

Simply insert the desired tip geometry into the handle, select your temperature and touch the tip to the InstaCal™ Sensor which plugs right into the power source. In just seconds, the system is calibrated to operate within ±15°C (27° F). Even if you change temperatures, the system and tip stay in calibration. When changing tips, the system will prompt the user to calibrate so you can always be sure your operating temperature meets your process specification, unlike other systems.

The TW100 TempWise™ comes standard with the following unique programming options:

- Password Protection
- Temperature Setback
- Auto Off
- User Definable Operating Temperature Range
- InstaCal™ Enable/Disable

Handpiece

The handpiece is uniquely designed to virtually eliminate operator fatigue, improve control and enhance productivity in the most demanding production soldering environments.

The heater and sensor are right at the tip, away from the handle keeping it cool and comfortable.

Instant Tip Changes

To change a tip geometry, simply grasp the tip cartridge with the supplied heat pad and pull the cartridge out and place it in the tool stand. Simply push in the new tip and you're ready to go.

Surplus Inventory Sale

As a preferred customer, we want to make you aware of potential savings that are available to you. STI as one of the largest distributors of electronic assembly and solder supplies occasionally has overstock on some items. We have created a surplus inventory list with prices drastically reduced. The surplus inventory list is available at our website www.solderingtech.com and is updated monthly. Please call (256) 461-9191 or 1-800-858-0604 and ask for Sales. One of our friendly customer service representatives will be glad to help you with your order or answer any questions that you may have. Quantities are limited so don't delay!

Soldering Technology International, Inc. (STI)

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Phone: 256-461-9191
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VISIT WWW.SOLDERINGTECH.COM

Jim's Corner
Intermetallics

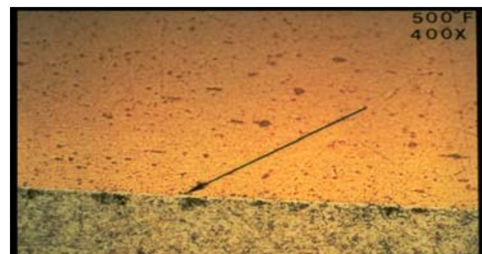
By: Jim D. Raby, PE

In discussing intermetallics, one must begin by discussing the term *wetting.* In the making of a solder connection, if one applies the correct temperature and dwell time for the mass of materials to be joined, then one will achieve wetting and make a strong solder joint. The act of wetting is an exchange of molecules between the solder alloy being used and the metals being joined. The most common materials in the electronics industries are copper (Cu) and the solder alloy, tin (Sn) / lead (Pb). As wetting begins, the tin molecules begin to migrate toward and into the copper and continues until wetting is accomplished. When wetting is achieved, tin molecules have entered into the copper, hence forming an intermetallic layer. When additional heat is added the layer of intermetallic increases in thickness, thus forming what is referred to as intermetallic compound.

Without intermetallics one does not achieve wetting. One can expect intermetallics to be a part of any good solder joint that we make and on any material that we use. Intermetallics will form on all metals generally used in the soldering operation. It, of course, does not form on steel and titanium since these are not solderable materials.

This intermetallic layer is known as a compound and, with the continuous application of heat, will become so thick it will become brittle. This is why in times past we made the solder joint in 2 to 5 seconds with an iron tip temperature of 750°. This transferred the heat into the work piece in minimum time, made the termination, and we had minimum thickness of intermetallics. Lesser temperature and longer dwell times will make more intermetallics.

Don't inspect for intermetallics, just know that they are there. Control the amount of intermetallics by controlling the process of making the solder joint. Rework and touch up adds to the intermetallic thickness.



Arrow Points to Intermetallic Layer