

Matt Kehoe

From: "Matt Kehoe" <mkehoe@sipad.net>
To: <mkehoe@sipad.net>
Sent: Monday, November 08, 2004 9:11 AM
Subject: Fw: NASA / SIPAD BGA Thermal Cycle Testing

Below are some emails beginning in November 2003 that were sent to me from the Marshal Space Flight Center in Huntsville Alabama. According to these test results, SIPAD BGA's are really proving to be more reliable and longer lasting than traditional paste and place technology when thermal cycled.

----- Original Message -----

From: [Strickland, Mark](#)
To: 'Matt Kehoe'
Sent: Tuesday, June 29, 2004 6:09 AM
Subject: RE: Whats new?

We are still testing, now at 2900+ thermal cycles. We have some preliminary results (Weibull plots) of SIPAD versus standard solder paste boards, however, the results have not been confirmed by metallurgical analysis. It is safe to say that the SIPAD assemblies have less data spread, in other words failure is more predictable. The metallurgical analysis should confirm the reason. Also, the SIPAD assemblies are outperforming the solder paste boards. Why do you think this is? I suspect it has to do with initial flatness but will have to confirm this.

We would like to publish our results somewhere and are preparing a technical paper. What forum would be appropriate to submit this type of report to? SMTA? Others?

----- Original Message -----

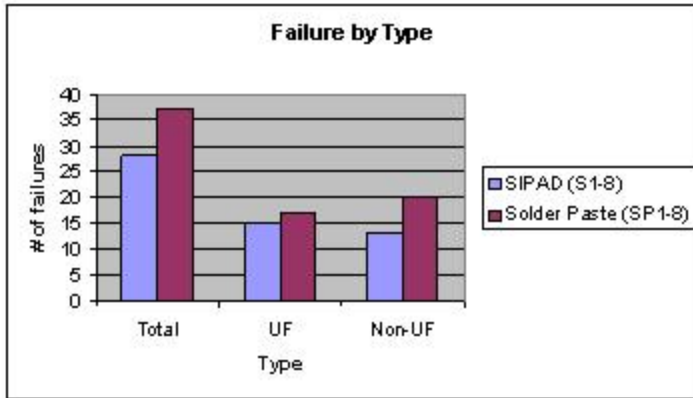
From: [Strickland, Mark](#)
To: [Matt Kehoe \(mkehoe@sipad.net\)](#)
Sent: Tuesday, March 16, 2004 9:07 AM
Subject: SIPAD Testing

The thermal cycle testing of the SIPAD boards vs standard paste boards is going well. We are at 1860 thermal cycles and have observed that the BGA's on the SIPAD boards are failing at a slower rate than those on the standard paste boards. The graph below shows the distribution of failures, however, the chronological failure log shows even better results for the SIPAD boards. When testing is complete, the Weibull plots will give a better picture of the failure distribution. We started with sixteen assemblies (six BGA's and four QFP's per assembly.) We currently have 15 boards in test; one solder paste board that has completely failed is in destructive physical analysis. After DPA is complete we can hopefully definitively state what the failure modes are.

In light of these early results, our plan is to start incorporating SIPAD into our designs for engineering units and research test vehicles that we will fabricate in the lab. This approach is supported by the ease of SIPAD use in a small volume operation and the apparent quality/reliability that it affords.

When the testing is complete we will formally publish and present the results of the study. Thanks for assisting us in this effort.

Mark Strickland
NASA/MSFC
Avionics Dept
Electronic Packaging/ED16
256-544-7432



----- Original Message -----

From: [Strickland, Mark](#)

To: 'SIPAD Systems'

Sent: Tuesday, February 17, 2004 10:23 PM

Subject: RE: Whats new

We are at 1600+ cycles and SIPAD is doing well. We've had a few failures of components on the SIPAD PWB's but not as many as with the standard HASL/paste boards. We've started sectioning one HASL/paste board that has totally failed, but don't know the failure mode yet. None of the SIPAD boards have totally failed.

Do you have any data on the relative flatness of SIPAD versus a typical HASL PWB?

----- Original Message -----

From: [Strickland, Mark](#)

To: 'SIPAD Systems'

Sent: Wednesday, November 26, 2003 12:23 PM

Subject: RE: Updates

Sorry it has taken me so long to get back with you. We are still testing and our now at 891 thermal cycles (-55 to 100C). Thus far it appears that the SIPAD is doing quite well. Any final conclusions will be made after we microsection to verify failure mode. The enclosed Powerpoint chart depicts the failures by type after 891 cycles. The test will continue for a few more months. However, we'll probably start microsectioning some of the boards in a few weeks once all the devices on a particular board have failed. Call

if you have questions.

Mark Strickland

My email address has changed to:

mark.strickland@nasa.gov or

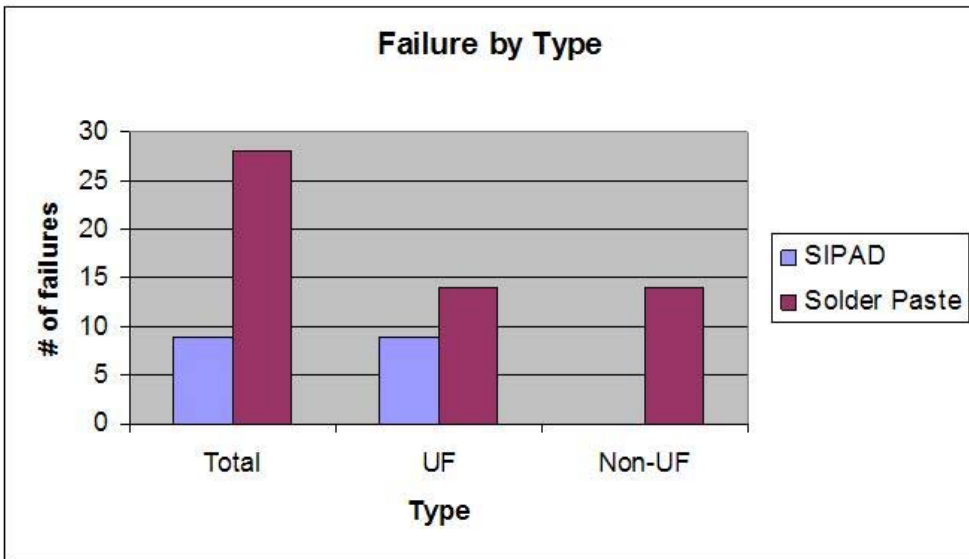
Stephen.M.Strickland@nasa.gov

Electronic Packaging

NASA/MSFC/ED16

256-544-7432

<http://workmanship-pbma-kms.intranets.com/login.asp?link=>



mk

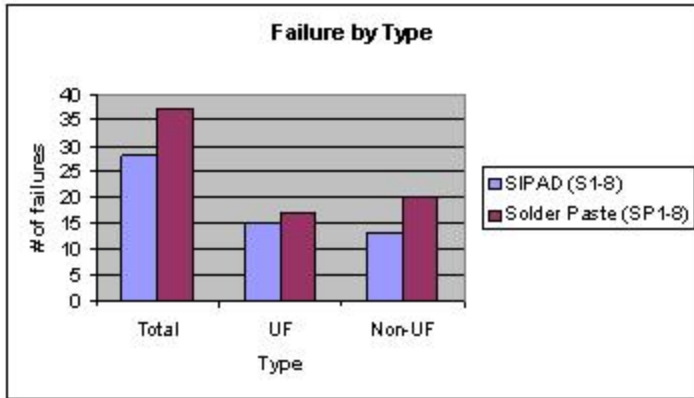
From: "Strickland, Mark" <Mark.Strickland@nasa.gov>
To: <mkehoe@sipad.net>
Sent: Tuesday, March 16, 2004 9:07 AM
Subject: SIPAD Testing

The thermal cycle testing of the SIPAD boards vs standard paste boards is going well. We are at 1860 thermal cycles and have observed that the BGA's on the SIPAD boards are failing at a slower rate than those on the standard paste boards. The graph below shows the distribution of failures, however, the chronological failure log shows even better results for the SIPAD boards. When testing is complete, the Weibull plots will give a better picture of the failure distribution. We started with sixteen assemblies (six BGA's and four QFP's per assembly.) We currently have 15 boards in test; one solder paste board that has completely failed is in destructive physical analysis. After DPA is complete we can hopefully definitively state what the failure modes are.

In light of these early results, our plan is to start incorporating SIPAD into our designs for engineering units and research test vehicles that we will fabricate in the lab. This approach is supported by the ease of SIPAD use in a small volume operation and the apparent quality/reliability that it affords.

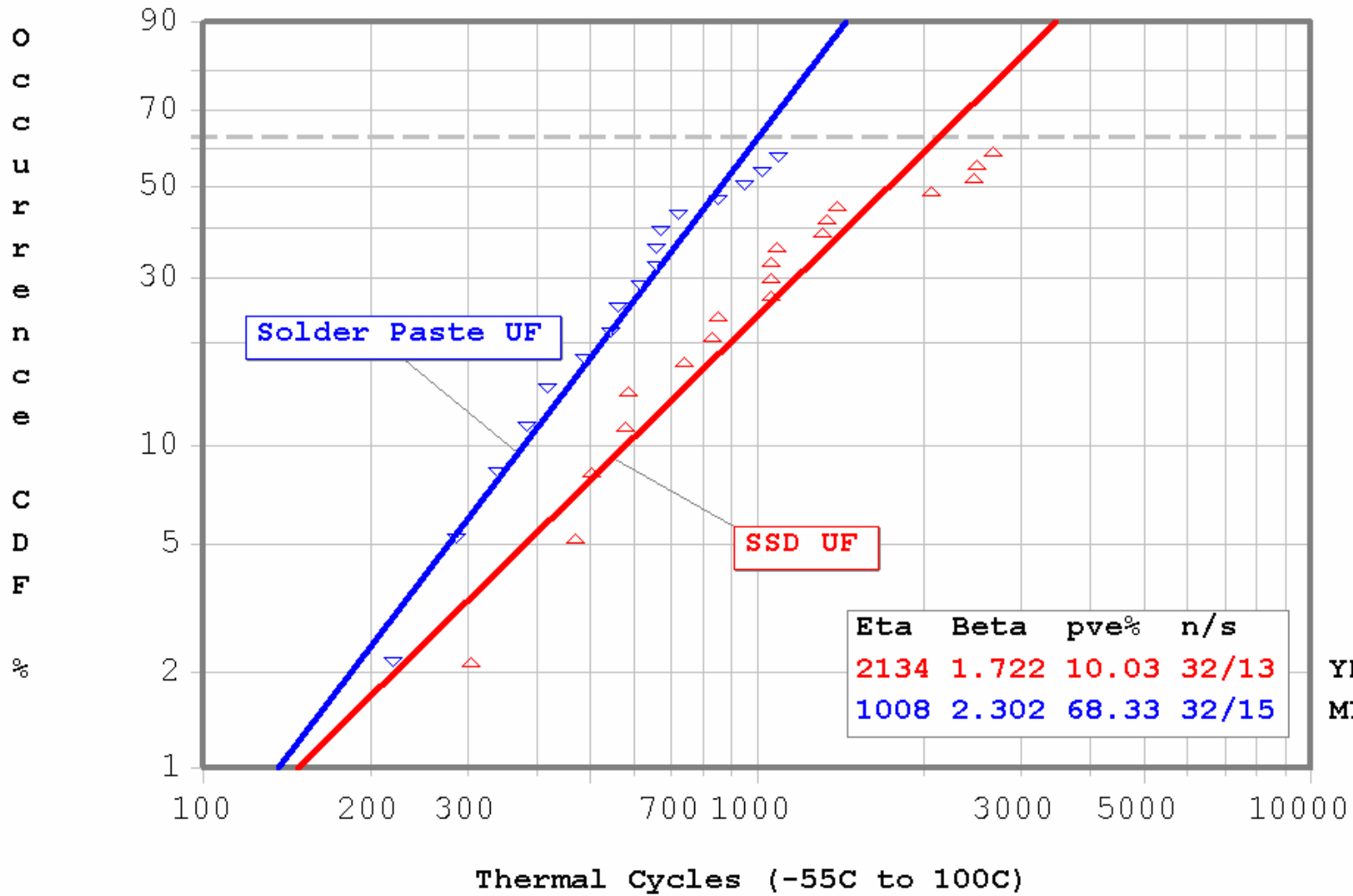
When the testing is complete we will formally publish and present the results of the study. Thanks for assisting us in this effort.

Mark Strickland
NASA/MSFC
Avionics Dept
Electronic Packaging/ED16
256-544-7432



**SSD vs Solder Paste
Underfilled Samples**

Information provided by NASA
Marshall Space Flight Center Huntsville AL.



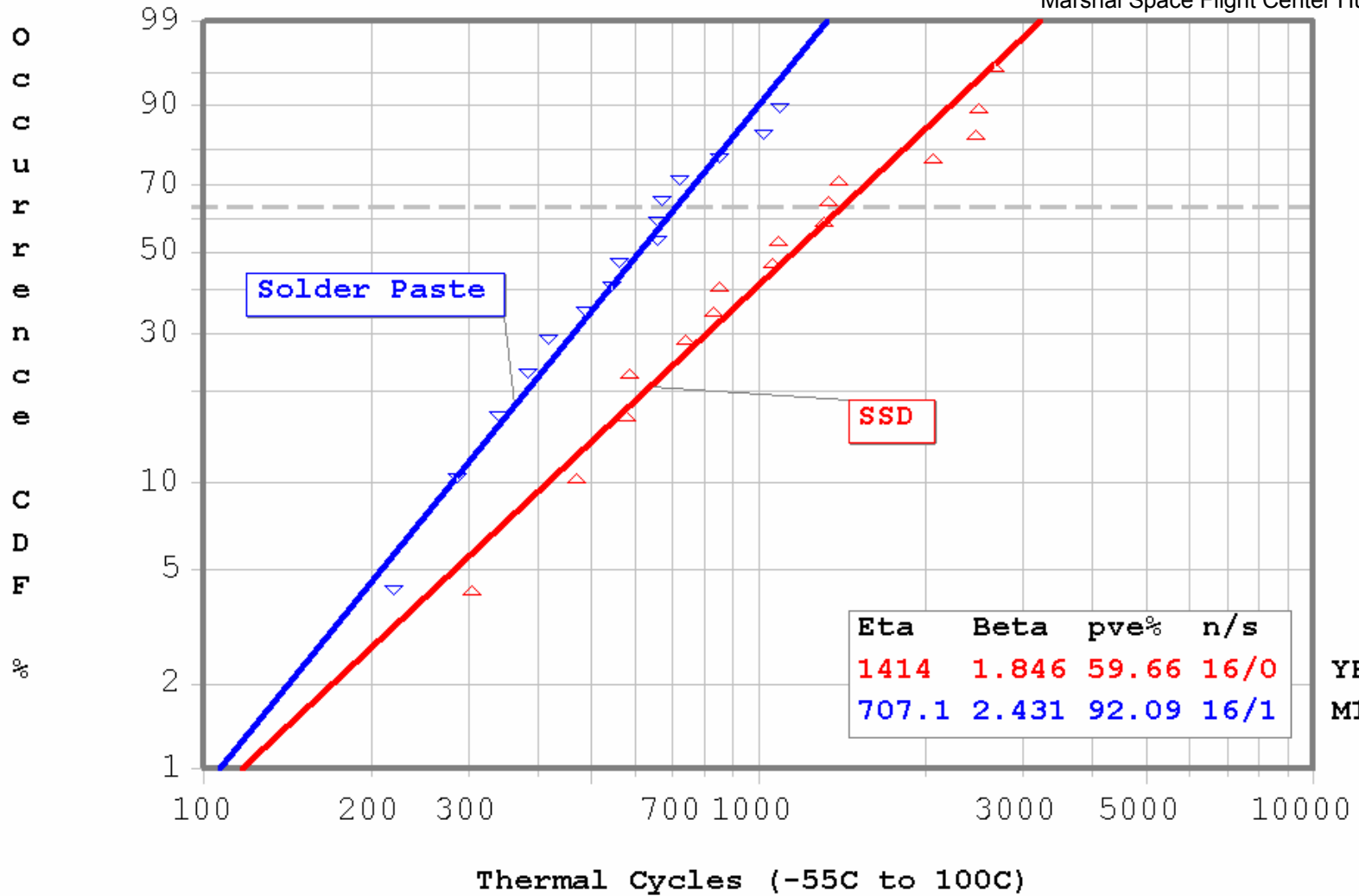
YR2004
M11D23

SSD vs Solder Paste for UF Perimeter Array

BGA352

Information provided by NASA

Marshall Space Flight Center Huntsville AL



YR2004
M11D23