



FCT Assembly
LEADERS IN TECHNOLOGY

Solder Paste Test Program (SPTP)



WS889 Solder Paste

Alloy: **SN100C Type 3** Metal Loading: **88.0%**
QC/Lot#: **23848** Mfg Date: **7/26/2012**

Contents

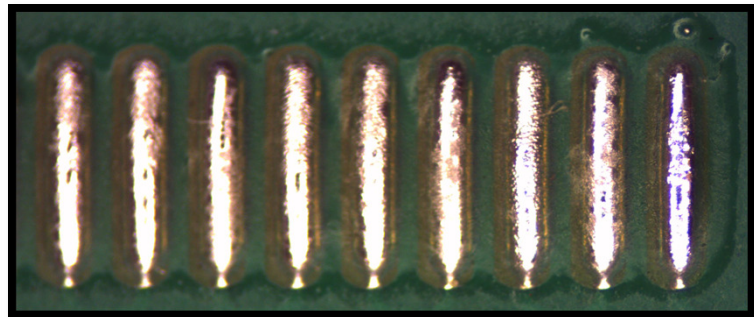
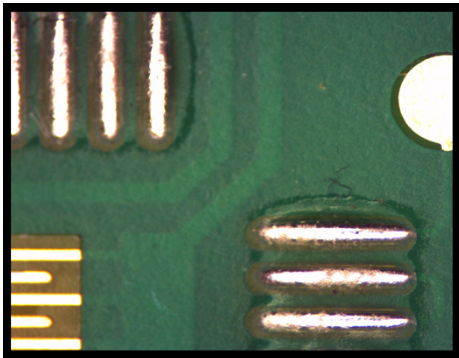
| | |
|------------|-----------------------|
| Section 1: | Summary |
| Section 2: | Standard Tests |
| Section 3: | Slump Data |
| Section 4: | Reflow Data |

Summary

WS889 is a water soluble lead free solder paste. Its attributes are below:

- * #1 performing paste in water soluble field for minimizing grapes
- * Excellent wetting paste
- * #1 paste inhibiting solder balls
- * Excellent cosmetics
- * Excellent cosmetics

Cosmetics



FCT Assembly

www.FCTAssembly.com

1309 North 17th Avenue | Greeley, Colorado 80631
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Standards Tests

WS889 Solder Paste

Metal Loading

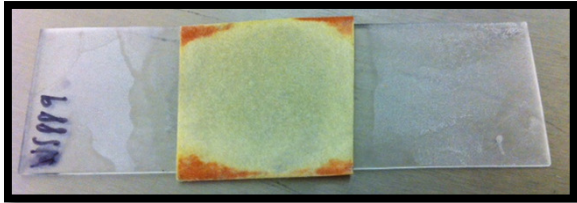
Metal 88.0%

Viscosity

Brookfield 770 Kcps
Malcom N/A

Silver Chromate

Shows Halides



Copper Mirror

Mirror Breakthrough

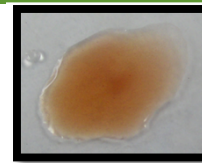


IPC Classification

ORH0

Flouride

Pass



Tack Testing

| 0 Hours | 24 Hours | 48 Hours | 72 Hours | 96 Hours |
|---------|----------|----------|----------|----------|
| 102.24 | 56.62 | 28.14 | 17.26 | 21.84 |

SIR

Pass

Electromigration

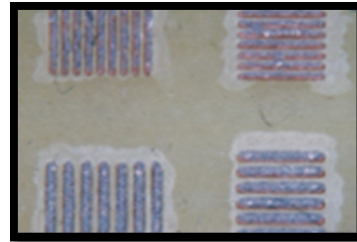
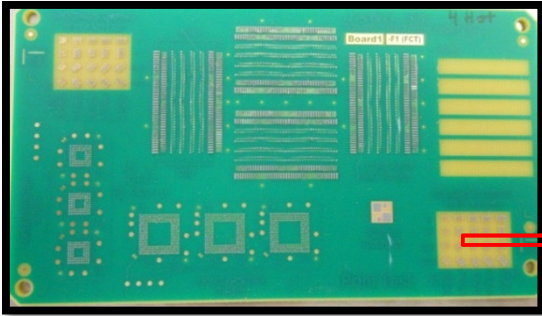
Pass





Cold Slump

WS889 Solder Paste



Cold Slump

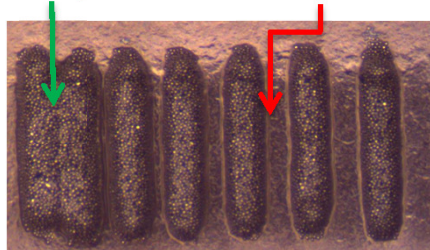
IPC Slump Results

Bridging Quantity

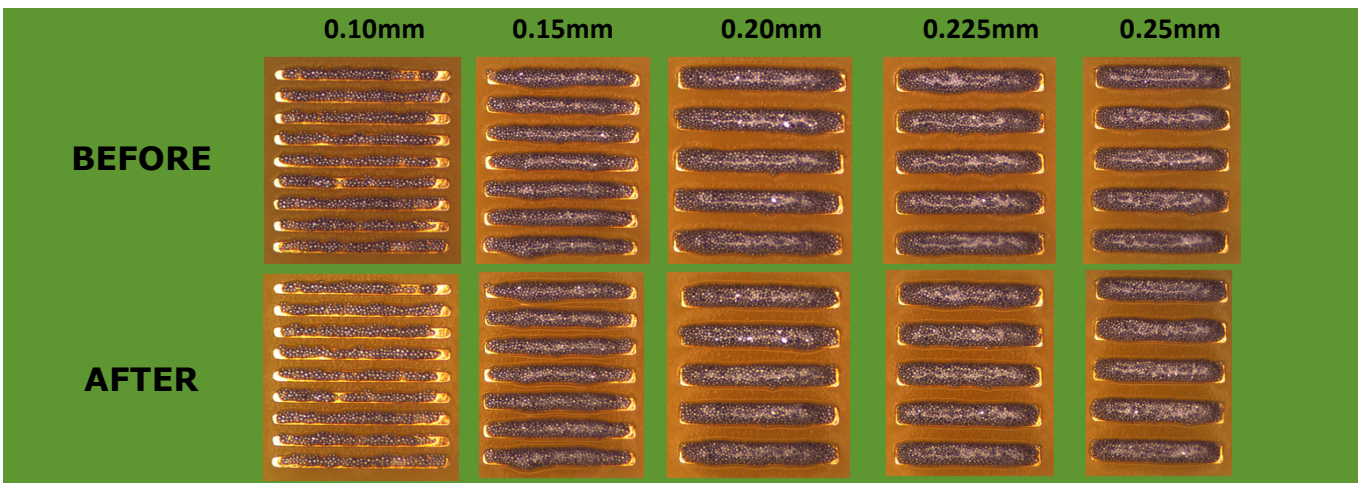
| Pad | Defect Count |
|---------|--------------|
| 0.10mm | 0 |
| 0.15mm | 0 |
| 0.20mm | 0 |
| 0.225mm | 0 |
| 0.25mm | 0 |

Cold Slump 0.06
Passing Result

25C slump fail limit (0.25mm)



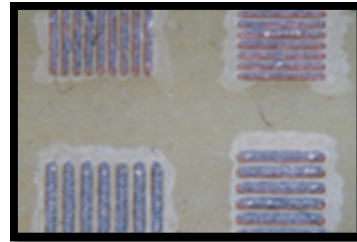
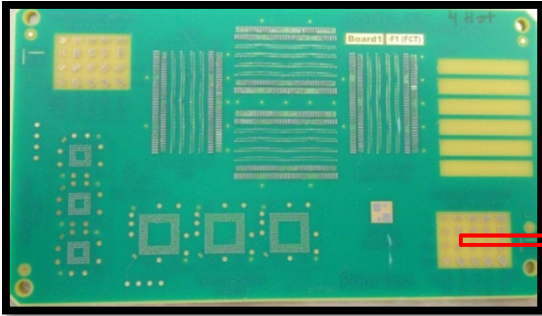
Cold Slump Test Board





Hot Slump

WS889 Solder Paste



Hot Slump

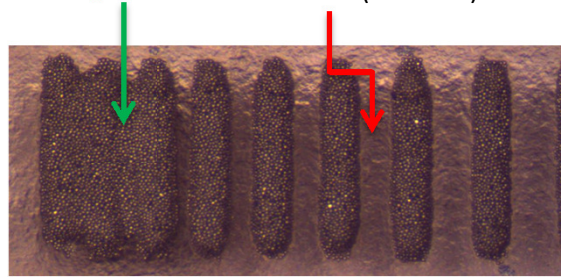
IPC Slump Results

Bridging Quantity

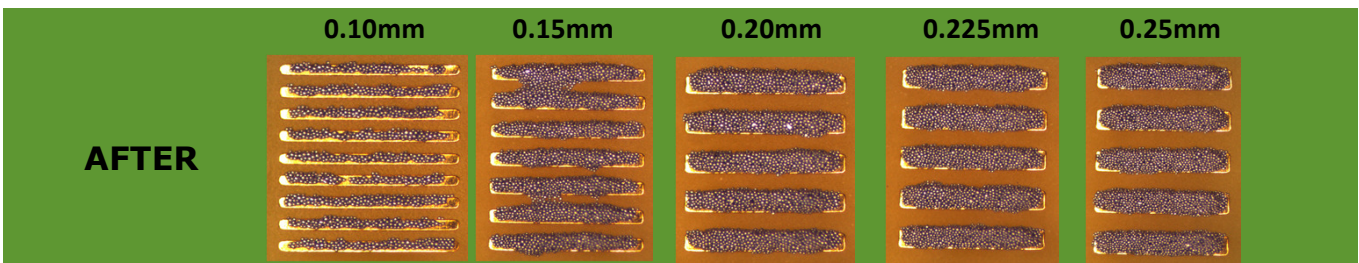
| Pad | Defect Count |
|---------|--------------|
| 0.10mm | 0 |
| 0.15mm | 2 |
| 0.20mm | 0 |
| 0.225mm | 0 |
| 0.25mm | 0 |

Hot Slump 0.15
Passing Result

150C slump fail limit (0.30mm)



Hot Slump Test Board





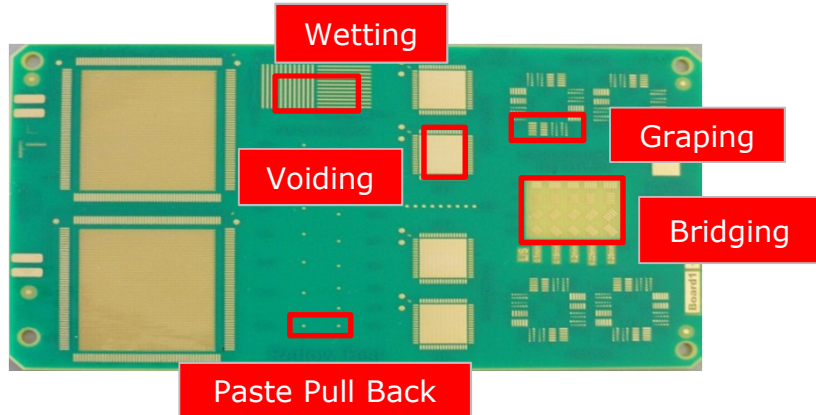
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Solder Paste Test Program

Reflow Data

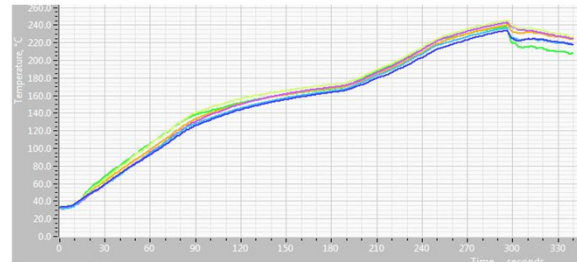
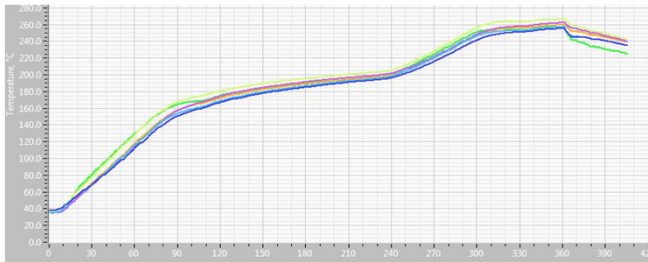
WS889 Solder Paste

Inspection Area Overview

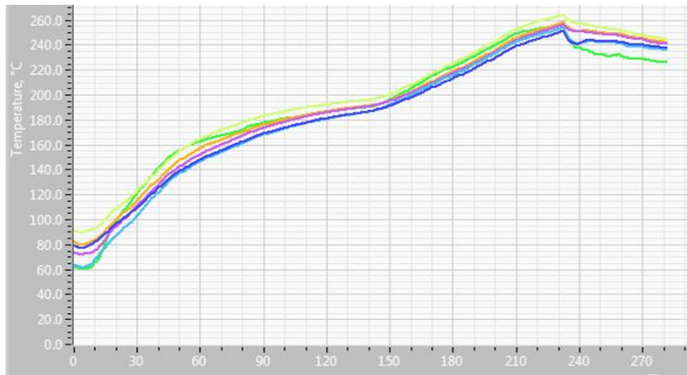


High Curve

Low Curve



Optimal Curve





Reflow Data (Graping)

WS889 Solder Paste

Graping Inspection

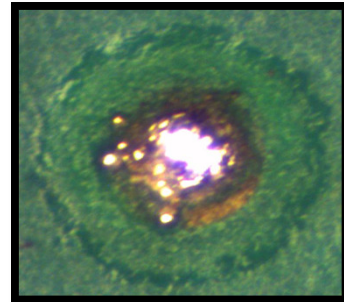
Measure the performance of graping on 96 pads with 1/2 being mask defined. Pad size varies from 7X7 mil to 12X12 mil. When counting the pads we identified the largest feature pad that showed the graping effect then counted all pads at this size and smaller. These are recorded in the tables below. Pads were on four different locations of the board.

Graping Comparison

| <u>Product</u> | <u>Total Grapes</u> |
|----------------|---------------------|
| NL932 | 29 |
| NL938PT | 20 |
| NL930PT | 37 |
| WS889 | 62 |
| Competitor A | 102 |
| Competitor B | 61 |

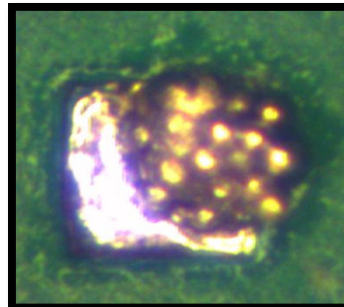
High

| CRD | Brd 1 | Brd 2 | Brd 3 | Brd 4 | Total |
|-----|-------|-------|-------|-------|-------|
| G1 | 15 | 13 | 10 | 18 | 56 |
| G7 | 14 | 15 | 13 | 13 | 55 |
| G10 | 15 | 11 | 9 | 15 | 50 |
| G15 | 12 | 6 | 10 | 13 | 41 |



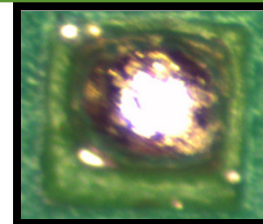
Low

| CRD | Brd 1 | Brd 2 | Brd 3 | Brd 4 | Total |
|-----|-------|-------|-------|-------|-------|
| G1 | 13 | 13 | 12 | 10 | 48 |
| G7 | 8 | 10 | 7 | 7 | 32 |
| G10 | 14 | 10 | 6 | 9 | 39 |
| G15 | 12 | 10 | 3 | 9 | 34 |



Optimal

| CRD | Brd 1 | Brd 2 | Brd 3 | Brd 4 | Total |
|-----|-------|-------|-------|-------|-------|
| G1 | 8 | 3 | 2 | 3 | 16 |
| G7 | 6 | 1 | 1 | 2 | 10 |
| G10 | 11 | 2 | 4 | 5 | 22 |
| G15 | 9 | 1 | 1 | 3 | 14 |

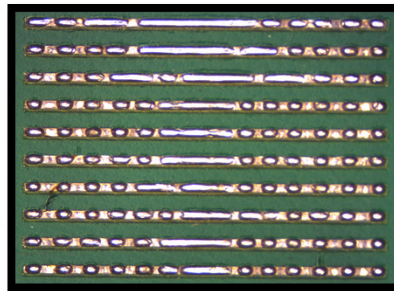


Reflow Data (Wetting)
WS889 Solder Paste
Wetting/Spread Inspection Test

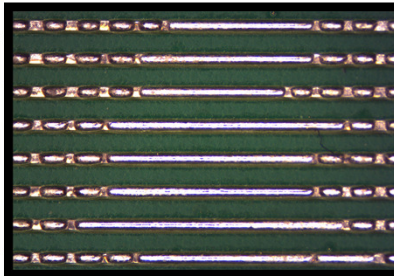
In each of the wetting/spread areas we identified the number of lines that had one or more bridge of the solder bricks. The maximum number of lines is 24. We then measure the most bricks that were bridged in one line. These results are shown below.

High

| Board | Total Lines | Most on 1 |
|-------|--------------|--------------|
| 1 | 20 out of 24 | 3 out of 15 |
| 2 | 19 out of 24 | 3 out of 15 |
| 3 | 22 out of 24 | 4 out of 15 |
| 4 | 22 out of 24 | 5 out of 15 |
| Total | 83 out of 96 | 15 out of 60 |


Low

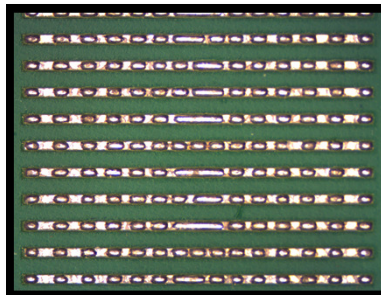
| Board | Total Lines | Most on 1 |
|-------|--------------|--------------|
| 1 | 21 out of 24 | 4 out of 15 |
| 2 | 24 out of 24 | 5 out of 15 |
| 3 | 22 out of 24 | 3 out of 15 |
| 4 | 24 out of 24 | 3 out of 15 |
| Total | 91 out of 96 | 15 out of 60 |


Wetting Comparison

| Product | Total | Most |
|--------------|-------|-------|
| NL932 | 24 | 11.75 |
| NL938PT | 24 | 14 |
| NL930PT | 24 | 14.5 |
| WS889 | 24 | 5.5 |
| Competitor A | 24 | 12 |

Optimal

| Board | Total Lines | Most on 1 |
|-------|--------------|--------------|
| 1 | 24 out of 24 | 4 out of 15 |
| 2 | 24 out of 24 | 7 out of 15 |
| 3 | 24 out of 24 | 5 out of 15 |
| 4 | 24 out of 24 | 6 out of 15 |
| Total | 96 out of 96 | 22 out of 60 |





Reflow Data (Solder Ball)

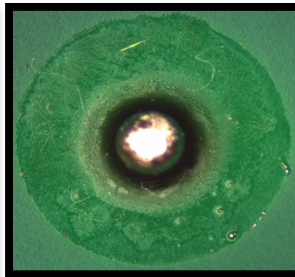
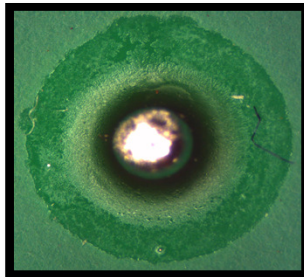
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Paste Pullback (Solder Ball)

Measure the performance by volume of the solder paste to pullback on a pad. The start of the volume was at 500% with the maximum being 1250%. Any solder ball that was found not coalescing with the rest of the solder was failed.

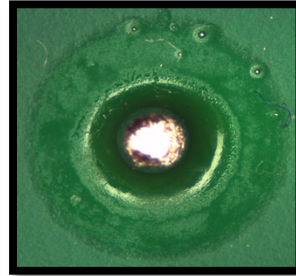
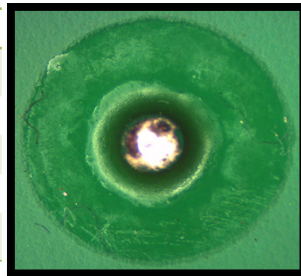
High

| Board | Pad Size |
|---------|----------|
| 1 | 1225% |
| 2 | 1225% |
| 3 | 1225% |
| 4 | 1225% |
| Average | 1225% |



Low

| Board | Pad Size |
|---------|----------|
| 1 | 925% |
| 2 | 1225% |
| 3 | 1225% |
| 4 | 1225% |
| Average | 1150% |

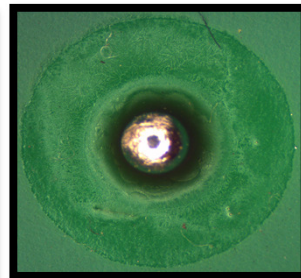
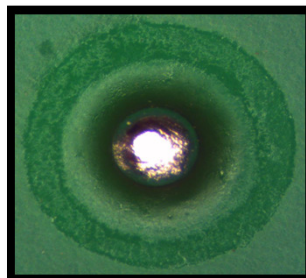


Paste Pullback Comparison

| Product | Total |
|--------------|-------|
| NL932 | 925% |
| NL938PT | 1050% |
| NL930PT | 525% |
| WS889 | 1225% |
| Competitor A | 963% |

Optimal

| Board | Pad Size |
|---------|----------|
| 1 | 1225% |
| 2 | 1225% |
| 3 | 1225% |
| 4 | 1225% |
| Average | 1225% |





Reflow Data (Bridging)

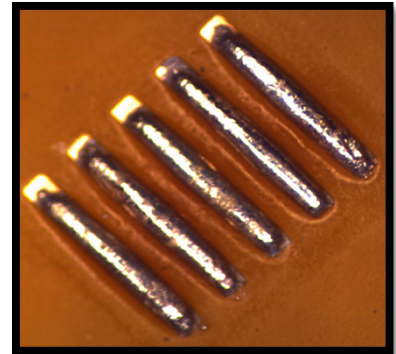
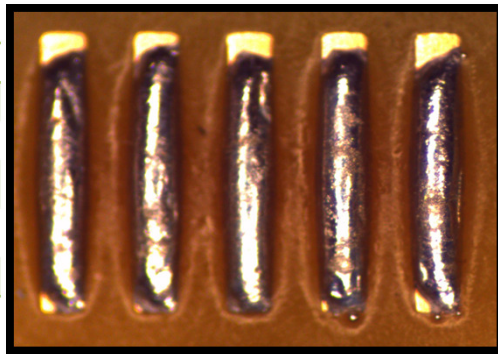
WS889 Solder Paste

Bridging Inspection

We measured the number of bridge occurrences and recorded in the tables below. We should note that the .1m m pads had minimal paste release which led to 0 bridges. Thus this pad offered no value in this study.

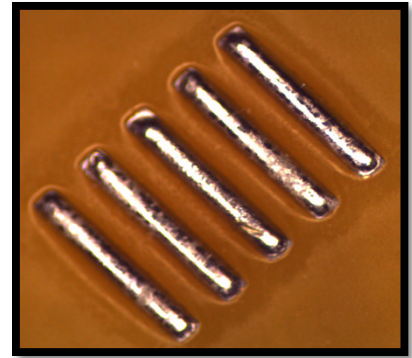
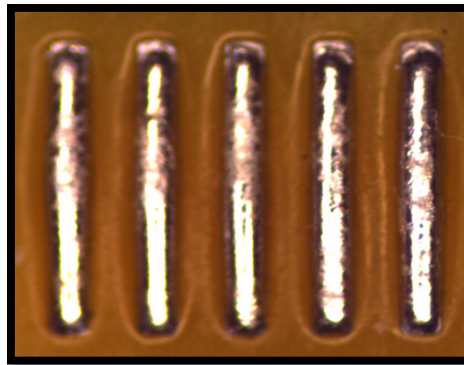
High

| Board | Defect Count |
|-------|--------------|
| 1 | 0 |
| 2 | 0 |
| 3 | 0 |
| 4 | 0 |
| Total | 0 |



Low

| Board | Defect Count |
|-------|--------------|
| 1 | 0 |
| 2 | 0 |
| 3 | 0 |
| 4 | 2 |
| Total | 2 |



Optimal

| Board | Defect Count |
|-------|--------------|
| 1 | 0 |
| 2 | 0 |
| 3 | 0 |
| 4 | 0 |
| Total | 0 |

