New Product Introduction

LOCTITE®ABLESTIK ABP 8303A

Conductive Die Attach Paste

Henkel

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Product Introduction or Quick Overview
LOCTITE®ABLESTIK ABP 8303A

- LOCTITE®ABLESTIK ABP 8303A silver filled, conductive die attach adhesive. It’s low outgassing, minimal RBO, low moisture absorption, high die shear strength and low stress makes it suitable for large die size and high reliability applications

LOCTITE®ABLESTIK ABP 8303A

Value Message and Proposition

- Applicable to wide die size range (2 mm x 2 mm – 7 mm x 7 mm)
- Suitable for different L/F and die backside surfaces
- Excellent workability, i.e. good dispensing, long open time/stage time
- No RBO, low outgassing, no discolor to Cu L/F
- Low Stress, High reliability, Automotive Grade 0 capable
- High Volume Manufacturing Ready Material

LOCTITE® ABLESTIK ABP 8303A

Basic Material Properties

Property	ABP 8303A	Property	ABP 8303A
Chemistry	BMI Hybrid	Weight Loss on Cure%, by TGA	2.8
Filler type	Silver	Bulk Thermal Conductivity (W/mK)	0.6
Density, g/ml	3.5	Volume R (Ohm cm)	0.062
Viscosity @ 25ºC (cps), 5rpm, CP51	10,500	Bond joint resistance, Au to Au, ohm	0.0012
Thixotropic Index, 0.5rpm/5rpm	4.6	Tg by TMA	30
Work Life @ 25ºC	24hrs	CTE1/CTE2 (ppm/ºC)	70/180
Recommended Storage Temperature	-40 ºC	Modulus @260ºC (MPa)	140
Storage Life (@ -40ºC)	1 year	Elongation % @ break, RT	5
Recommended Cure profile	30min ramp to 175ºC hold 60min, N2		

LOCTITE®ABLESTIK ABP 8303A

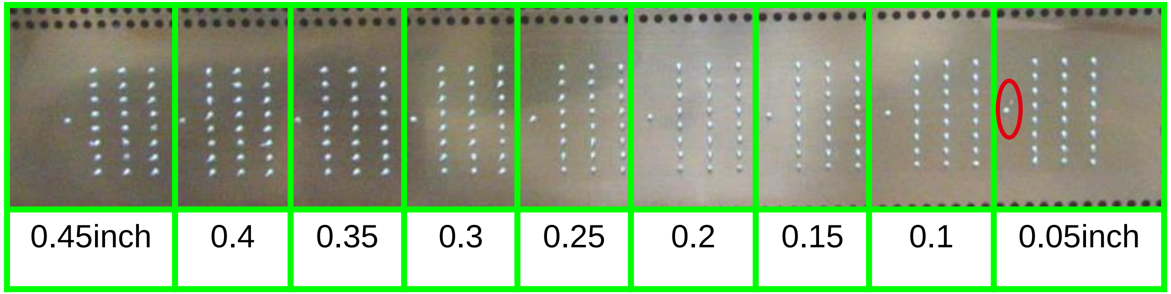
Internal Evaluation Plan

- Dot Dispensing
- Resin Bleed Out
- Adhesion Strength
- Warpage
- Workability: Open / Stage Time
- Pre-condition
- Thermal Cycle Testing (TCT)

LOCTITE®ABLESTIK ABP 8303A

Dot Dispensing - Henkel Test Methodology

- Henkel has standard dot dispensing method: totally dispense 9 groups with the same parameters except different retract distance. This testing simulates different UPH from low to high, output is total defective dot quantity



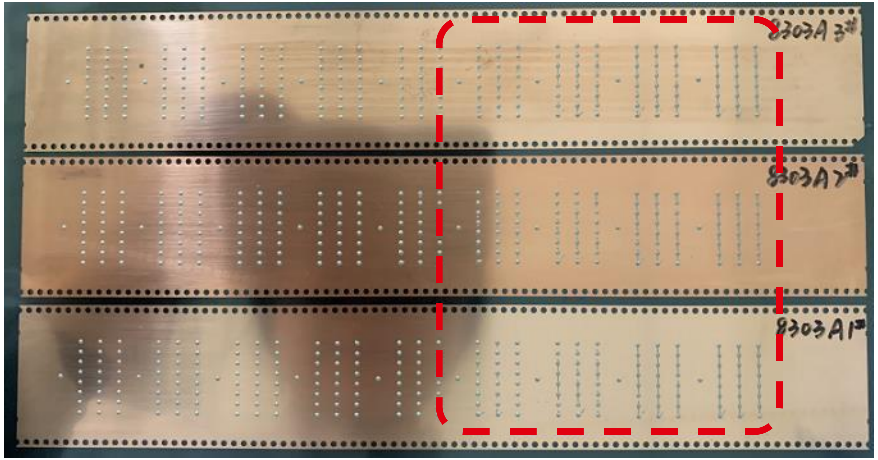
Retract distance reducing, UPH increasing

Nozzle: EFD 22G
Machine: Camalot FX-D

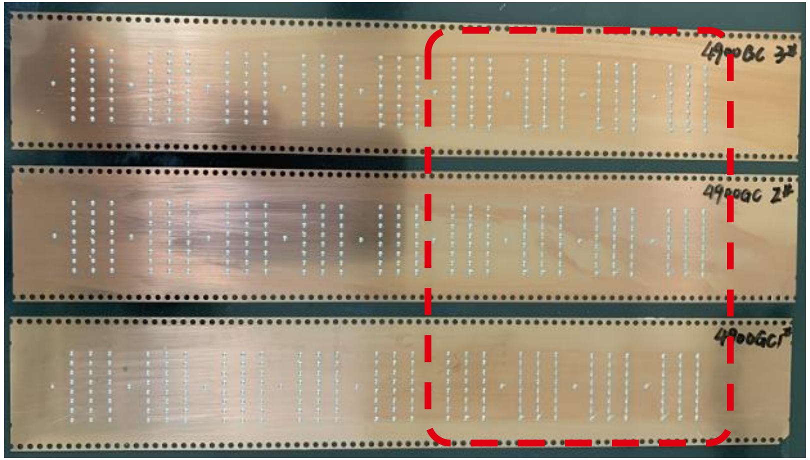
LOCTITE® ABLESTIK ABP 8303A

Internal Evaluation Data – Dot Dispensing

- By visual inspection, 8303A and Competitor had similar dispensing tailing status, from group #6, more and more tailing dots



ABP 8303A

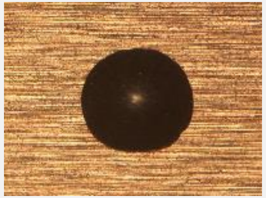
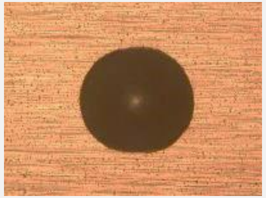
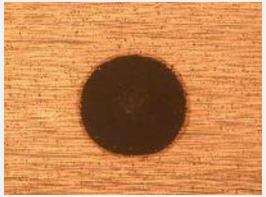
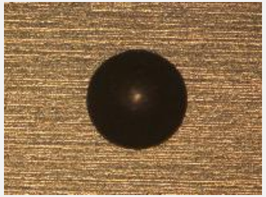
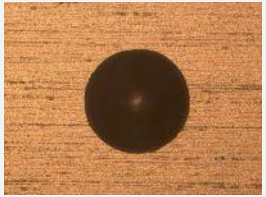
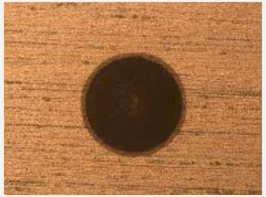
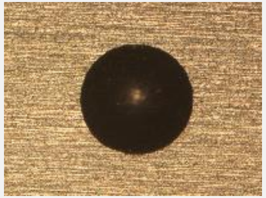
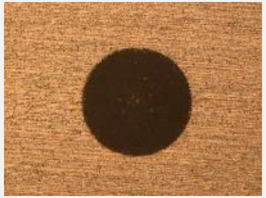


Competitor

LOCTITE® ABLESTIK ABP 8303A

Resin Bleed Out (RBO)

- No RBO on Cu, Ag & PPF leadframe

L/F	0min	2hrs	Cured
Cu			
Ag			
PPF			

LOCTITE®ABLESTIK ABP 8303A

Adhesion Strength - Test Flow

Die bond
Datacon 2200 EVO
↓
Cure
30min ramp to 175C, hold 1hr, N2
↓
Xray & RT DSS
↓
HT DSS
260C

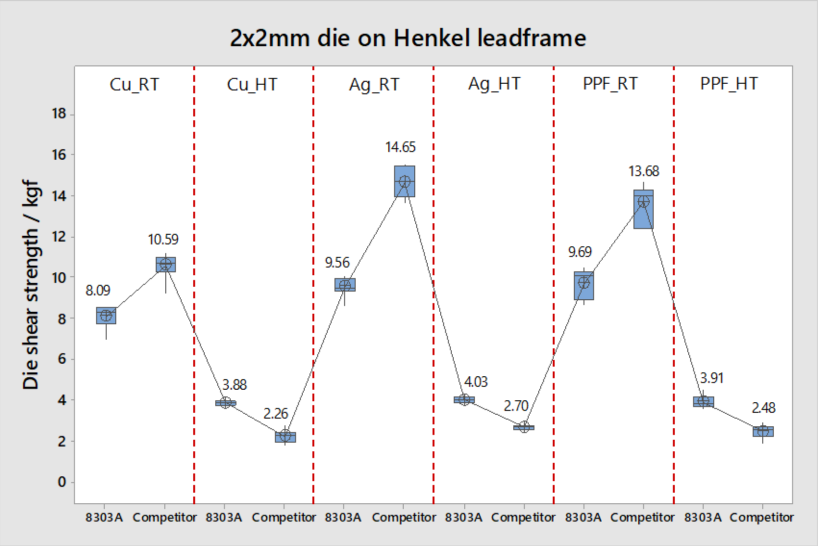
Die size (mm)	Leadframe	BLT (um)	Adhesion test condition
2x2	Henkel QFN PPF/Cu/Ag	25	RT
			HT DSS
7x7	Henkel QFN PPF/Cu/Ag	40	HT DSS

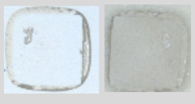
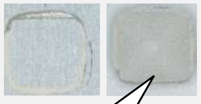
- Die bond:
  Datacon 2200EVO

- Die shear:
  Dage 4000

LOCTITE®ABLESTIK ABP 8303A

Adhesion Strength - RT & 260C HTDSS, Die Size 2 x 2 mm



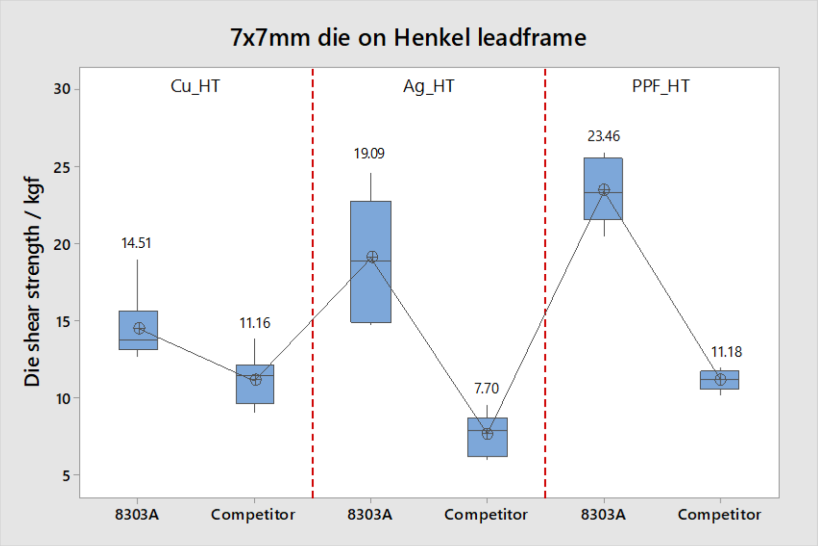
Paste		8303A		Competitor	
Condition		RT	HT DSS	RT	HT DSS
Cu	Fail mode	Cohesive	Cohesive	Cohesive	Partial Co.
	Picture				
Ag	Fail mode	Cohesive	Cohesive	Cohesive	Ad. to L/F
	Picture				
PPF	Fail mode	Cohesive	Cohesive	Cohesive	Ad. to L/F
	Picture				

Die

- ABP 8303A has significantly higher HT DSS than Competitor

LOCTITE®ABLESTIK ABP 8303A

Adhesion Strength - 260C HTDSS, Die Size 7 x 7 mm



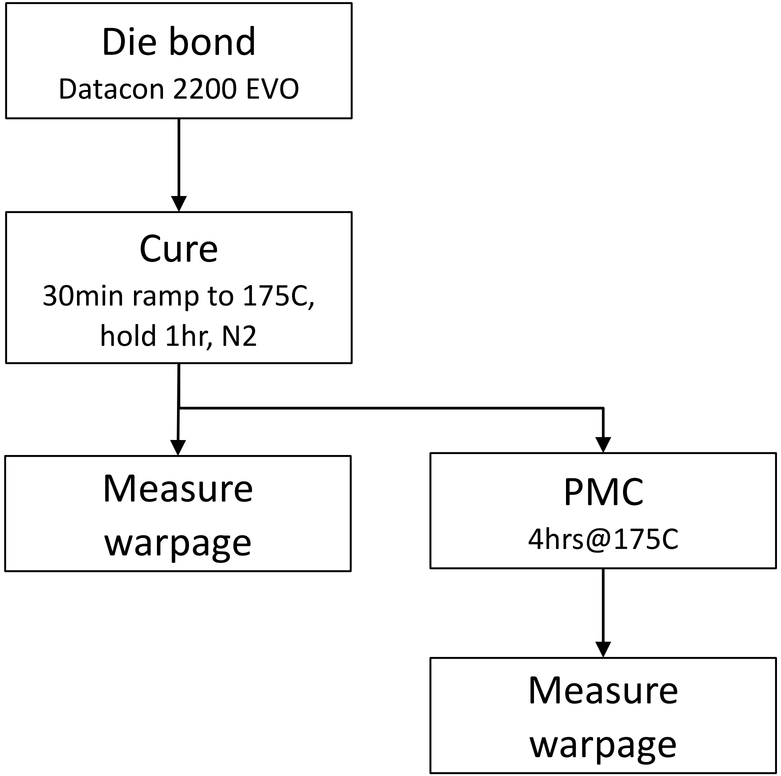
Paste		8303A	Competitor
Condition		HT DSS	HT DSS
Cu	**Fail mode**	Partial Co.	Partial Co.
	Picture		
Ag	**Fail mode**	Partial Co.	Ad. to L/F
	Picture		
PPF	**Fail mode**	Partial Co.	Ad. to L/F
	Picture		

Die

- ABP 8303A has significantly higher HT DSS than Competitor

LOCTITE®ABLESTIK ABP 8303A

Warpage - Test Flow



Die bond
Datacon 2200 EVO

Cure
30min ramp to 175C,
hold 1hr, N2

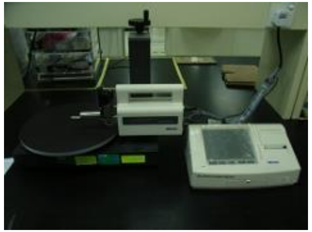
Measure warpage

PMC
4hrs@175C

Measure warpage

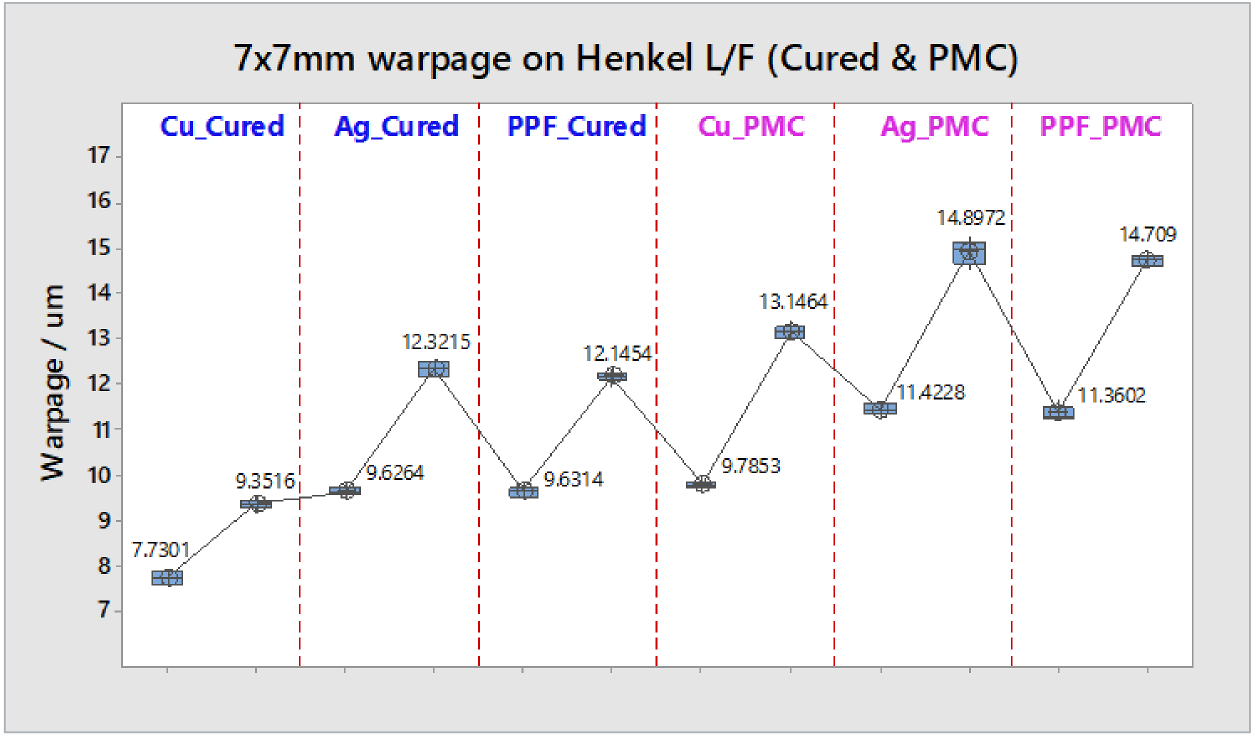
- Die size: 7x7mm, 380um thickness
- L/F: Henkel L/F
- BLT: 40um
- Die bonder: Datacon 2200EVO

- Warpage tester: Profilometer



LOCTITE®ABLESTIK ABP 8303A

Warpage - Die Size 7 x 7 mm

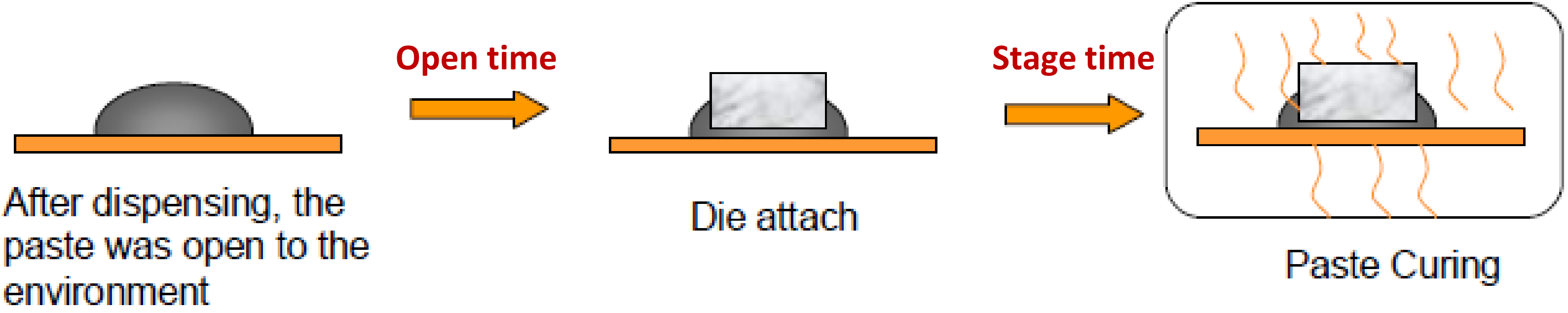


- ABP 8303A has lower warpage than Competitor

LOCTITE®ABLESTIK ABP 8303A

Workability : Open / Stage Time Test - Description

- **Open time:** the time after dispensing and before DA, at that moment the paste was open to the environment
- **Stage time:** the time after DA and before curing



LOCTITE®ABLESTIK ABP 8303A

Workability : Open Time Test - Test Flow

Dispensing
Datacon 2200 EVO

Wait
Several mins @ RT

Die bond
Datacon 2200 EVO

Check fillet
Microscope, X-Ray

Cure
60min @ 175C, N2

Adhesion test
260C HTDSS

- Die size: 2x2mm, 380um thickness
- Dispensing patter: cross
- Nozzle: EFD 25G
- L/F: Cu
- Bond force: 70g
- Bond time: 50ms

- Die bond:
  Datacon 2200EVO

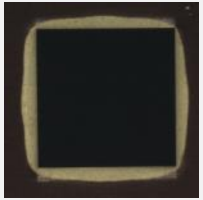
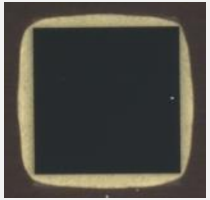
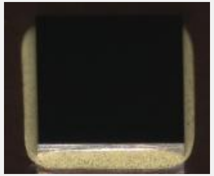
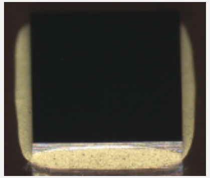
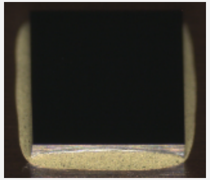
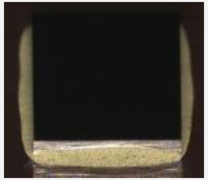
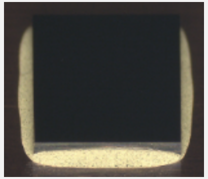
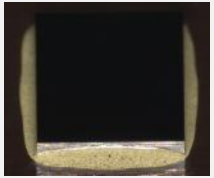
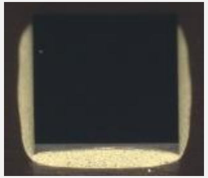
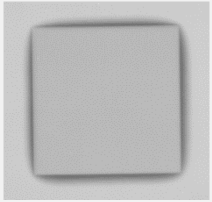
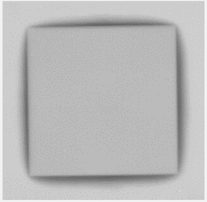
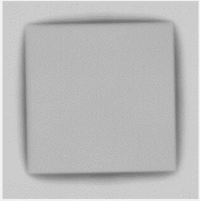
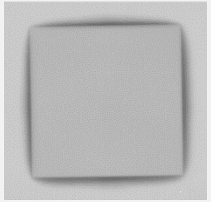
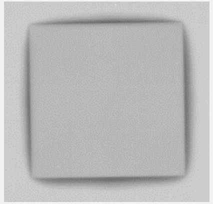
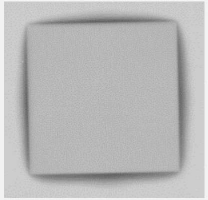
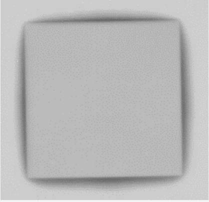
- Die shear:
  Dage 4000

- X-Ray:
  Phoenix

LOCTITE®ABLESTIK ABP 8303A

Workability : Open Time Test - Fillet Inspection

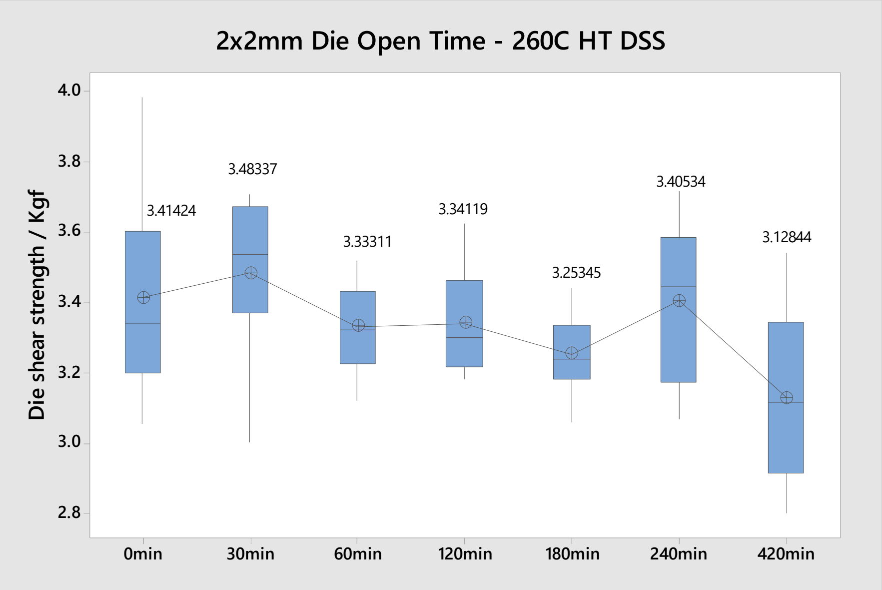
- No wetting issue and void free even 420min open time

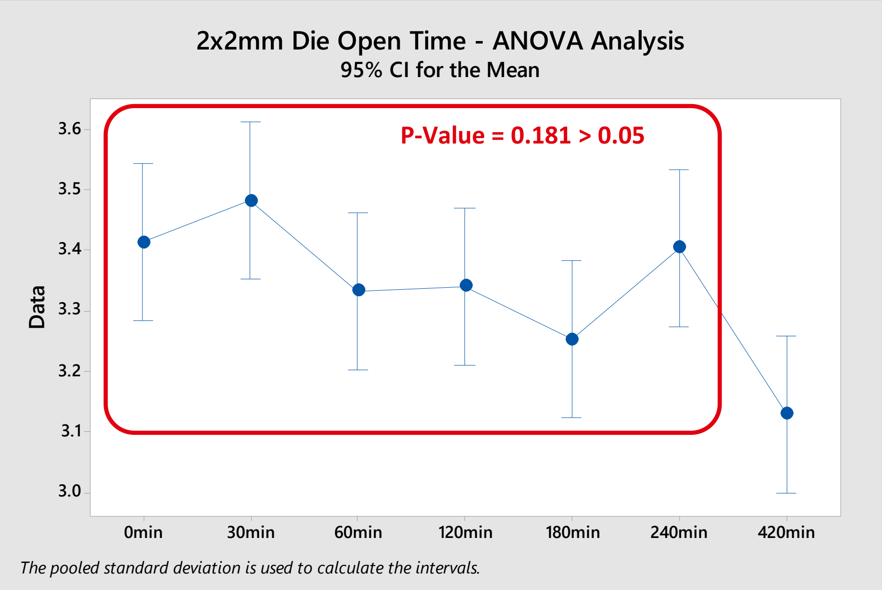
Open Time	0min	30min	60min	120min	180min	240min	420min
Top view							
Side view							
X-Ray							

LOCTITE®ABLESTIK ABP 8303A

Workability : Open Time Test - Adhesion

- No significant HTDSS reduction within 240min, slight decline at 420min. So for 2x2mm die size, the open time should be above 240min at least



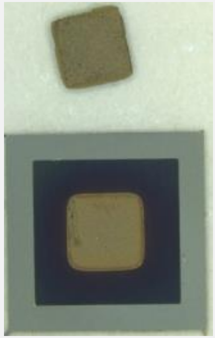
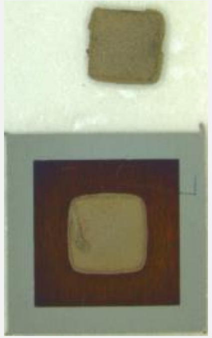
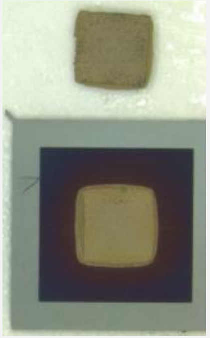
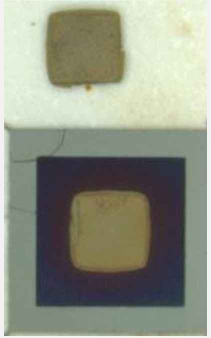
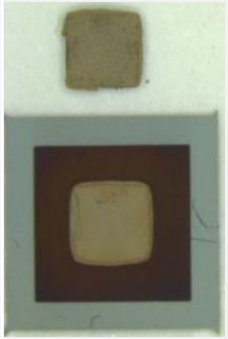
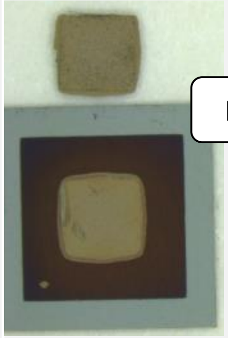
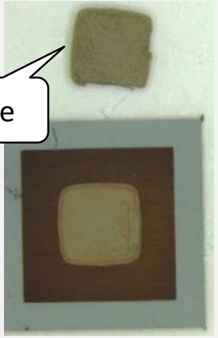


The pooled standard deviation is used to calculate the intervals.

LOCTITE®ABLESTIK ABP 8303A

Workability : Open Time Test - Adhesion Fail Mode

- No HTDSS fail mode change even 420min open time

Open time	**0min**	**30min**	**60min**	**120min**	**180min**	**240min**	**420min**
Fail mode	Cohesive	Cohesive	Cohesive	Cohesive	Cohesive	Cohesive	Cohesive
Picture							

LOCTITE®ABLESTIK ABP 8303A

Workability : Stage Time Test - Test Flow

Dispensing
Datacon 2200 EVO

Die bond
Datacon 2200 EVO

Wait
Several mins @ RT

Cure
60min @ 175C, N2

Check void
X-Ray

Adhesion test
260C HTDSS

- Die size: 2x2mm, 380um thickness
- Dispensing patter: cross
- Nozzle: EFD 25G
- L/F: Cu
- Bond force: 70g
- Bond time: 50ms

- Die bond:
  Datacon 2200EVO

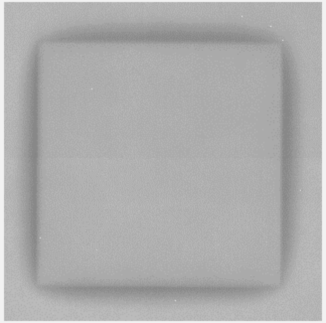
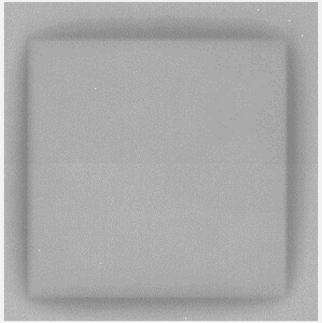
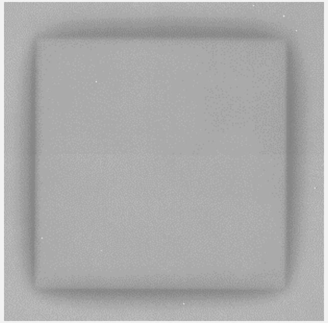
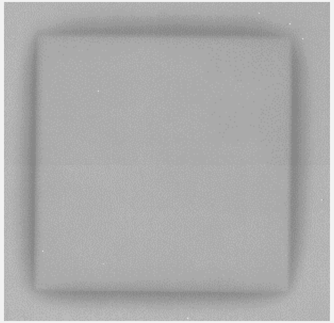
- Die shear:
  Dage 4000

- X-Ray:
  Phoenix

LOCTITE® ABLESTIK ABP 8303A

Workability : Stage Time Test - Void Check

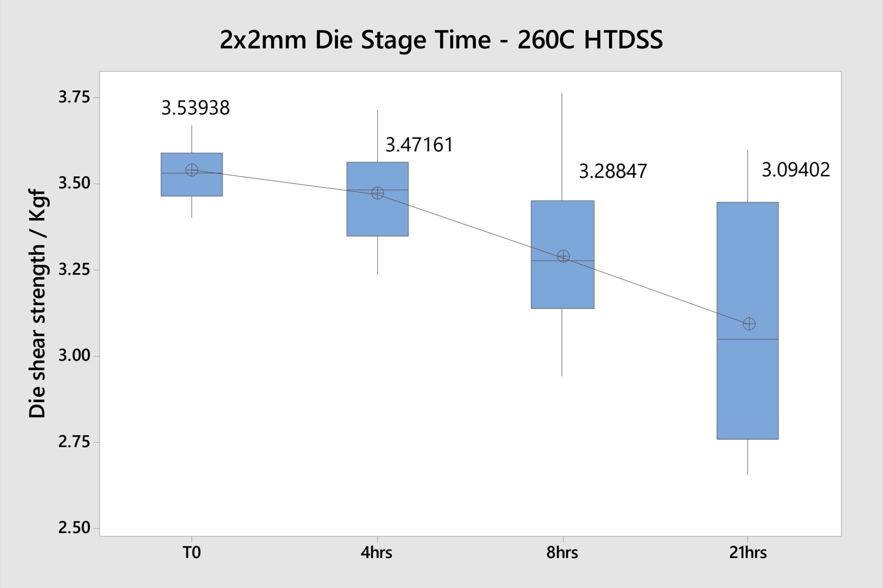
- Void free even 21hrs stage time

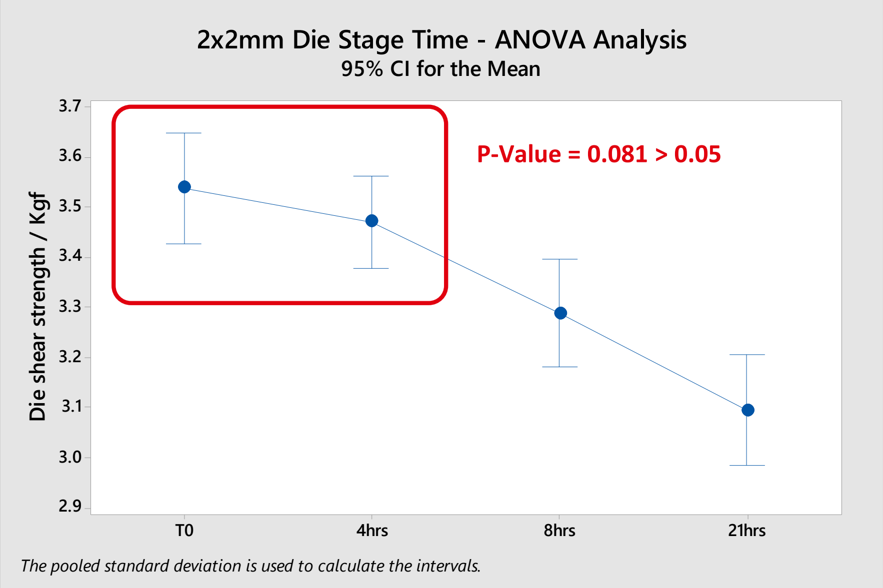
Stage Time	0min	4hrs	8hrs	21hrs
X-Ray				

LOCTITE®ABLESTIK ABP 8303A

Workability : Stage Time Test - Adhesion

- No significant HTDSS changing until 4hrs stage time. HTDSS declines only 7% after 8hrs and 13% after 21hrs, so 8303A can keep very strong adhesion in long stage time



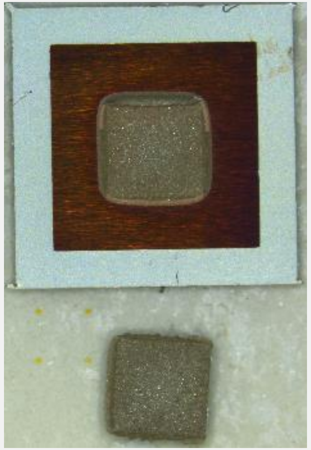
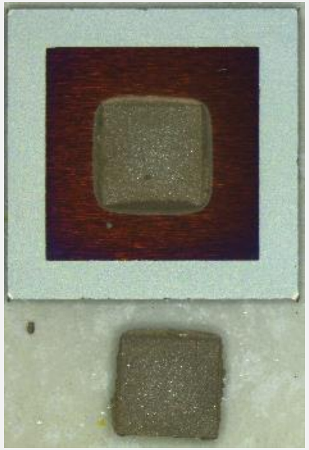
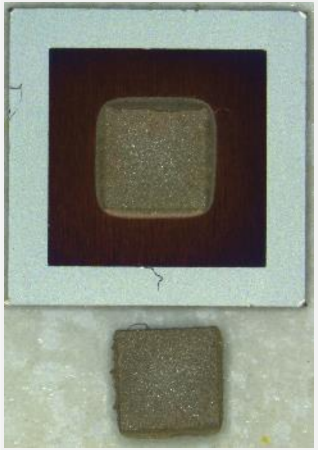
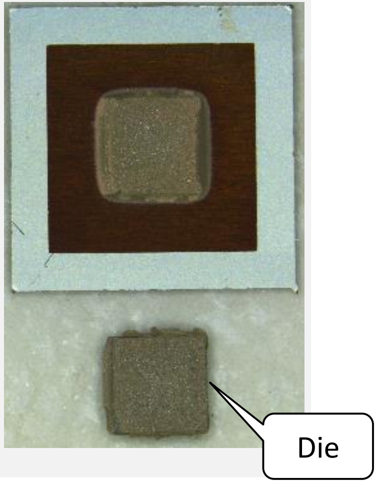


The pooled standard deviation is used to calculate the intervals.

LOCTITE®ABLESTIK ABP 8303A

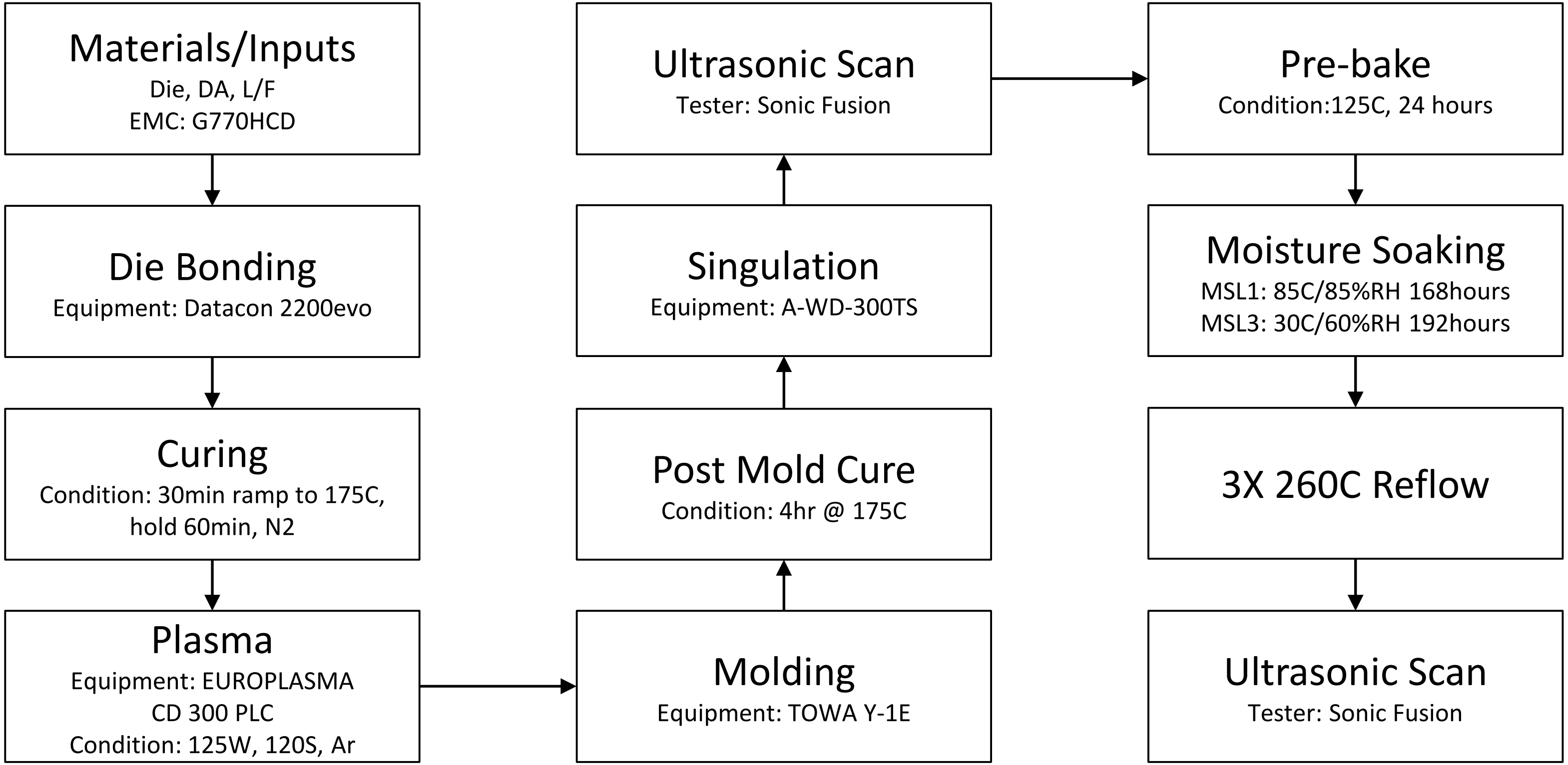
Workability : Stage Time Test - Adhesion Fail Mode

- No HTDSS fail mode changing even 21hrs stage time

Stage Time	**0min**	**4hrs**	**8hrs**	**21hrs**
Fail mode	Cohesive	Cohesive	Cohesive	Cohesive
Picture				

LOCTITE®ABLESTIK ABP 8303A

Pre-condition - Test Flow



Materials/Inputs
Die, DA, L/F
EMC: G770HCD

Die Bonding
Equipment: Datacon 2200evo

Curing
Condition: 30min ramp to 175C, hold 60min, N2

Plasma
Equipment: EUROPLASMA CD 300 PLC
Condition: 125W, 120S, Ar

Molding
Equipment: TOWA Y-1E

Post Mold Cure
Condition: 4hr @ 175C

Singulation
Equipment: A-WD-300TS

Ultrasonic Scan
Tester: Sonic Fusion

Pre-bake
Condition:125C, 24 hours

Moisture Soaking
MSL1: 85C/85%RH 168hours
MSL3: 30C/60%RH 192hours

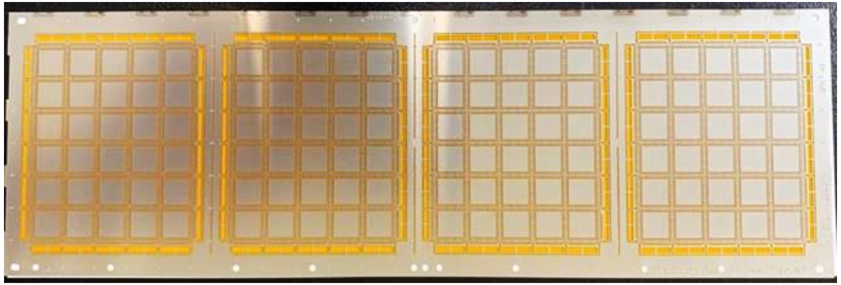
3X 260C Reflow

Ultrasonic Scan
Tester: Sonic Fusion

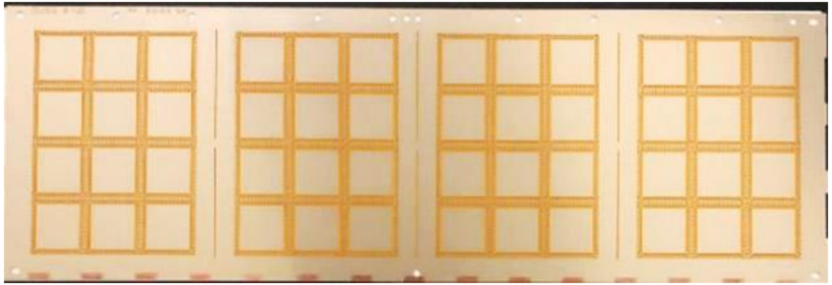
LOCTITE®ABLESTIK ABP 8303A

Pre-condition - Test Plan

PKG	Die size (mm)	Paste	Wet BLT (um)	L/F	Remark
QFN 7x7	2x2	8303A	25+/-5	Cu, Ag, PPF	8303A vs. Competitor reliability 22ea / leg
QFN 12x12	7x7		45+/-5		
QFN 7x7	2x2	Competitor	25+/-5	Cu, Ag, PPF	
QFN 12x12	7x7		45+/-5		



QFN 7x7 L/F layout



QFN 12x12 L/F layout

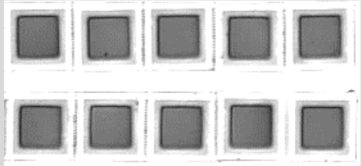
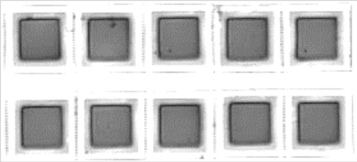
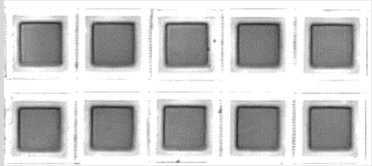
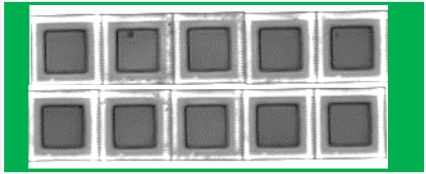
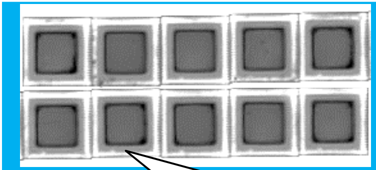
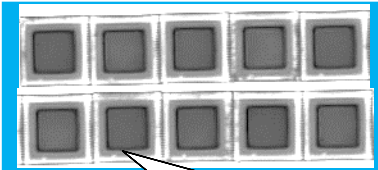
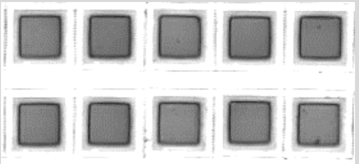
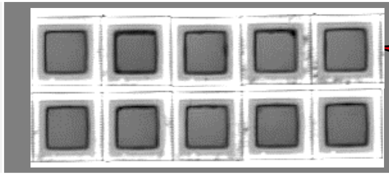
LOCTITE®ABLESTIK ABP 8303A

Pre-condition - Test Result

Pre-con	PKG	Die size	L/F	ABP 8303A	Competitor
MSL3	QFN 7x7	2x2 mm	Cu	**Pass**	**Pass**
			Ag	**Pass**	**Pass**
			PPF	**Pass**	**Pass**
	QFN 12x12	7x7 mm	Cu	**Pass**	**Pass**
			Ag	**Pass**	Fail (22 / 22)
			PPF	**Pass**	Fail (22 / 22)
MSL1	QFN 7x7	2x2 mm	Cu	**Pass**	Fail (22 / 22)
			Ag	Fail (22 / 22)	Fail (22 / 22)
			PPF	Fail (22 / 22)	Fail (22 / 22)
	QFN 12x12	7x7 mm	Cu	Fail (20 / 22)	Fail (22 / 22)
			Ag	Fail (22 / 22)	Fail (22 / 22)
			PPF	Fail (22 / 22)	Fail (22 / 22)

LOCTITE®ABLESTIK ABP 8303A

Thermal Cycle Testing (TCT)

Material		7x7mm die (Pre-con MSL3)		
		Cu	Ag	PPF
8303A	Before			
	After		 Die edge & corner slight delam	 Die edge & corner slight delam
Competitor	Before			
	After	 Die edge & corner slight delam		

Test condition
-65C ~ 150C,
1000 cycles

- **ABP 8303A had better TCT performance than competitor**

LOCTITE®ABLESTIK ABP 8303A

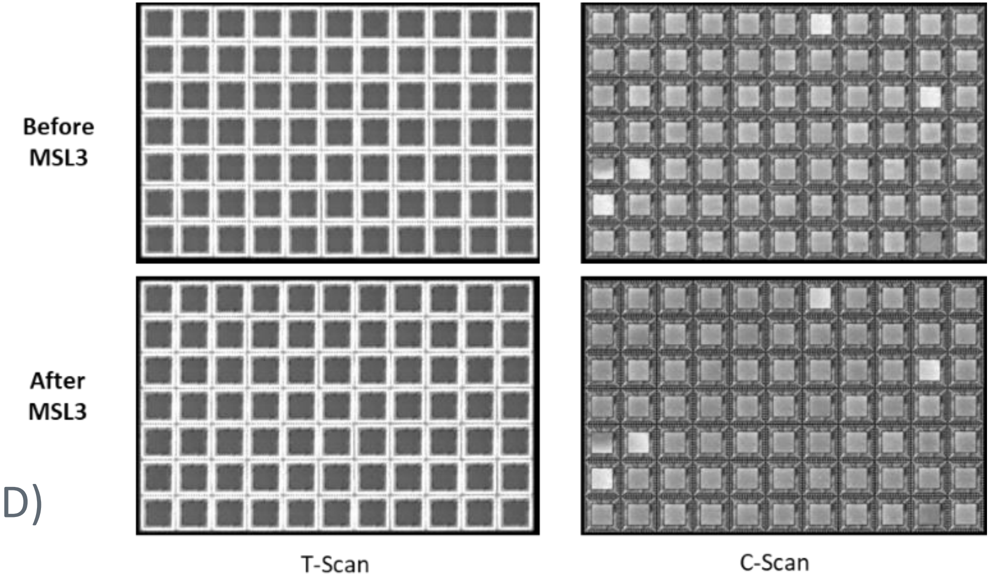
Internal Evaluation - Key Takeaways

- Excellent dot dispensability
- ABP 8303A has significantly higher HT DSS than competitor
- Significantly lower warpage compared to competitor
- Good open time even for small die applications (240 min for 2 mm x 2 mm)
- Pass MSL1 for die size 2 mm x 2 mm on Cu LF
- Pass MSL3 for die size 7 mm x 7 mm on Cu, Ag, PPF
- ABP 8303A has much better TCT performance compared to competitor

LOCTITE®ABLESTIK ABP 8303A

Application Case Histories

- Customer: B
- End User: H
- Application: Logical IC
- Package Type: QFN 7x7
- Die Pad: Cu Leadframe
- Die Size: 4.4mm x 4.4mm x 6mils(t)
- ESEC Needle Dispensing, 0.25 mm (ID)
- MSL3 260C
- Team: China AEE Semiconductor Team



LOCTITE®ABLESTIK ABP 8303A

External Evaluation or Reliability Data

Customer	Evaluation type	PKG	Die size (mm)	Die pad	Reliability
A	Dummy	QFN	6x6	Cu	**MSL3 pass**
	Dummy	QFN	0.5x0.5~8x8	Cu, rough PPF	Ongoing
B	Dummy	QFP	4.4x4.4	Cu	**MSL3 pass**
	Real device	QFP	4.4x4.4	Cu	**MSL3 pass**
C	Dummy	QFP	3.5x3.5	Cu & Ag	**MSL1 pass**
	Dummy	QFP	6x6	Cu	**MSL1 pass**
D	Dummy	QFN	1x1~5x5	Cu	**MSL3 pass**

LOCTITE®ABLESTIK ABP 8303A

External Competitive Technologies

- Hitachi EN 4900GC
- Sumitomo

LOCTITE® ABLESTIK ABP 8303A

Target Markets and Customers

❑ Target Markets

- General Purpose Analog
- Telco/5G
- Automotive

❑ Target Customers

- JCET
- TFME
- TSHT
- Amkor
- ASE
- Microchip
- UTAC
- STM
- Several Other OSATs and IDMs

LOCTITE®ABLESTIK ABP 8303A

Sales Collaterals – TDS, MSDS, Data Packages

- **TDS** http://tds.henkel.com/tds5/search.asp

ABP 8303A-EN TDS.pdf

- **MSDS** http://mymsds.henkel.com/mymsds/DS.do?bu=UT,UA&internet=true

ABP 8303A-MSDS.pdf

- **Data Packages**

ABP 8303A Data Package

➢ **Latest TDS and MSDS can found at the provided the links**

LOCTITE®ABLESTIK ABP 8303A

Regulatory

Chemical Inventory Notification Status (Y/N/LVE)						
USA	**EUROPE**	**CHINA**	**KOREA**	**JAPAN**	**PHILIPPINES**	**THAILAND**
LVE	LVE	Y	Need apply LVN	Y	Need apply LVE	Y

LOCTITE®ABLESTIK ABP 8303A
Article IDH Numbers and Pricing

FG IDH	Description	List Price
2601825	LOCTITE ABLESTIK ABP 8303A 5CC/10CC SY EFD, 17.5gm	78.93 USD/con
2601816	LOCTITE ABLESTIK ABP 8303A 10CC/10CC SY EFD, 35gm	121.58 USD/con

- List price can be checked on APriL and contact MSH / PLM for price based on volume break down

LOCTITE®ABLESTIK ABP 8303A

Contact details for further information

Role	Name
PD	David Huang
TCS	Rick Shen
PE	Li Wang
PTM	Geoffrey Yu
MSH	Raj Peddi

Thank You