DAF(Die Attach Film) Introduction

AMC DAF Product line Summary

DEVICE	TYPE	ITEM	APPLICATION
DAF	Non UV type	AWP2	Small chip
		AWP3	Normal chip
	UV type	ES-229NS	Small chip
		ES-229N	Normal chip

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Non-UV type(Dicing film)

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DAF Process

Through AWP2, AWP3 series(Non-UV DAF) application, semiconductor packaging companies can get a 1-step process(UV process) reducing benefit.

WBL + Wafer → Mounting → Dicing → No UV(AWP2, AWP3 series) → Pick up → Die bonding → Wiring → EMC Molding

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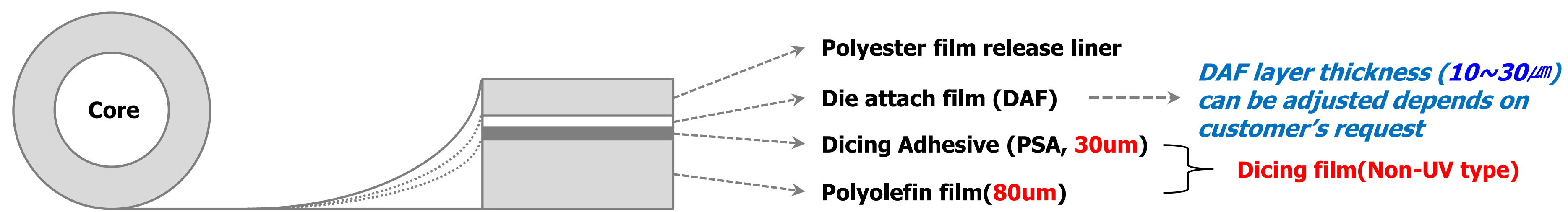
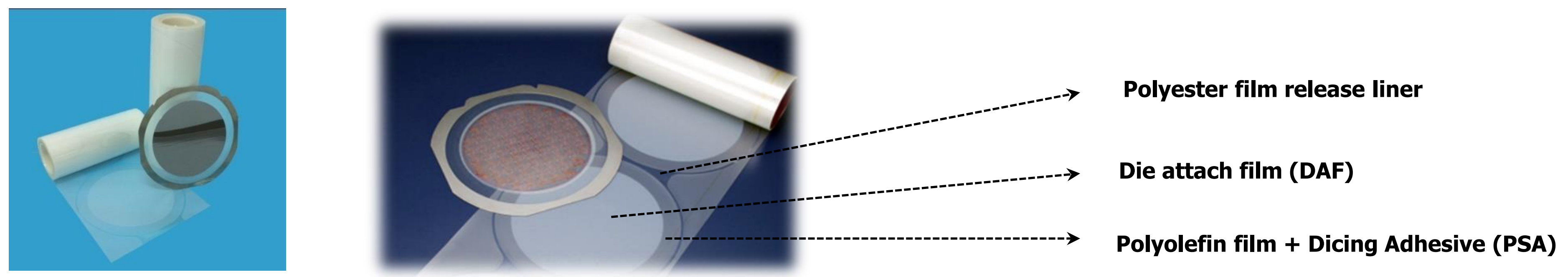
DAF Structure & Shape

DAF is consist of 4 layers including die attach film(DAF) layer.
And DAF layer has circle shape to fit for ring frame and wafer attachment.

DAF Structure



DAF Shape



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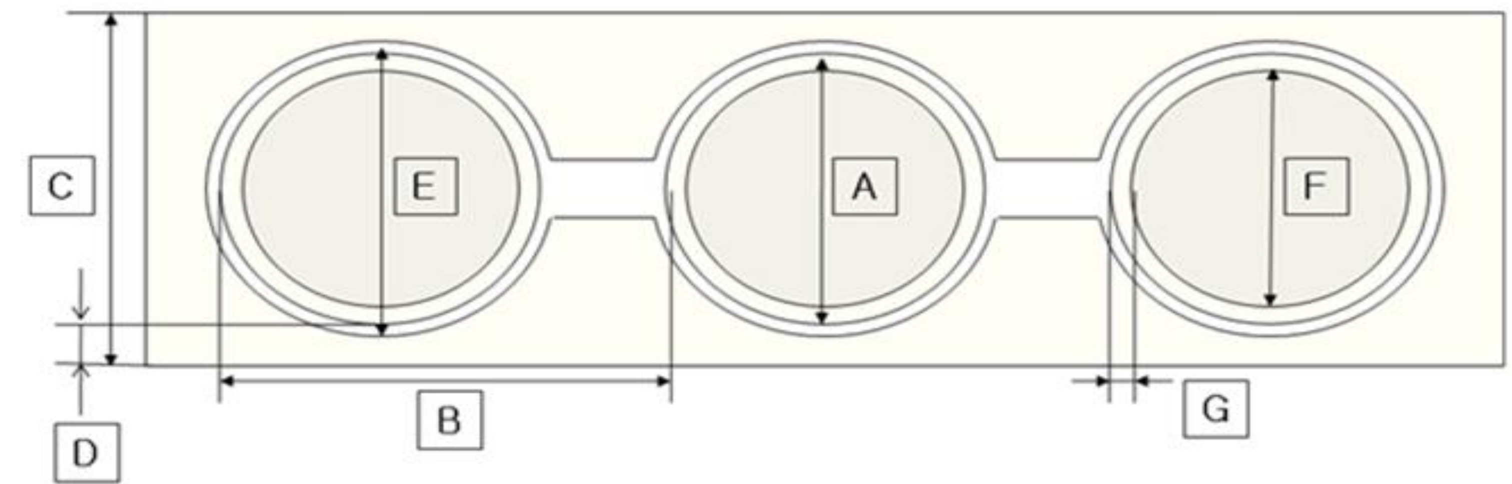
DAF Pre-cut

AMC guarantees below specification and actual test result shows stable performance.
And Pre-cut size can be adjusted depends on customer's request.



(Unit: ㎛)

	A	B	C	D	E	F	G
8 inch	270±1	279.5±1.5	290±2	10±2	277±1	220±1	25±5
12 inch	370±1	378.5±1.5	390±2	10±2	377±1	320±1	25±5

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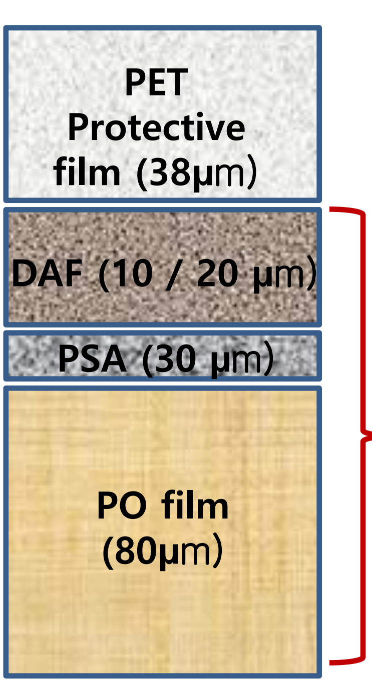
DAF Properties & Line-up

AMC checks and controls other properties even though not included in specification.



Properties			Unit	AWP2	AWP3
Modulus (DMA)	After Full cure	50 ~ 300℃	Mpa	354.5(@150℃) 214.4(@250℃)	8.44(@150℃) 6.35(@250℃)
Die Shear Strength	Full Cure	@R.T	Mpa	9.3	39.5
		@260℃	Mpa	4.8	11.7
CTE & Tg	α 1		ppm	58.4	213
	α 2		ppm	170.1	259.7
DSC Data	Before cure	On-set Temp	℃	176.7	189.3
		Delta H	J/g	45	38.79
Tg(DMA)	After Full cure	Tg	℃	200.2	239.3
Tensile properties	Adhesive layer	5% Modulus(MD)	MPa	9.54	4.67
		Elongation(MD)	%	26	268
	Dicing Tape	5% Modulus(MD)	MPa	5.03	
		5% Modulus(TD)	MPa	4.83	
		Elongation(MD)	%	636	
		Elongation(TD)	%	545	
180° Peel Strength	WBL Tape (DAF-Dicing)	Before UV	N/25mm	0.25	
	WBL-Wafer	Mount 60℃/70℃	N/25mm	0.72 / 1.08	0.76 / 1.14
Water Absorption	under 85℃/85%	after 24hr	wt%	0.75	0.86

- **Application**

  AWP2 series : under die size 3*3mm

  AWP3 series : over die size 3*3mm

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Evaluation Results (AWP3 series)

√ Test Product Model

Dummy wafer

√ Test Parameter

Spindle RPM		Feed Speed	Blade Height	Dicing Blade	Cut Method	Die size
Z1	45,000	30 mm/s	90um	ZH05-SD3500-N1-CC	Full Cut	5mm×5mm

√ Test Image

√ Pick-up height(um)

Sample	AWP3 series	H 社	D 社
Pick-up	**400**	**500**	**600**

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UV type(Dicing film)

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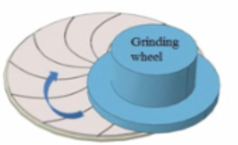
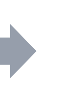
DAF Process

Through DAF application, semiconductor packaging companies can get a 1-step process reducing benefit and overcome the weakness(※) of paste attach process.

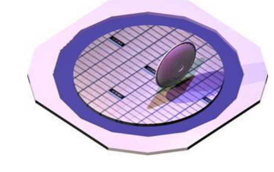
Conventional(Paste) Process

Back Grinding
for wafer thinning, thickness control





Dicing(singulation)
for chip size sawing



Use Dicing Tape

Die Attach
for chip bonding to substrate with paste

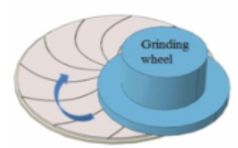
Use Die Attach Material(Paste)

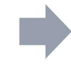
Final product

Reduce process from 2 steps to 1 step

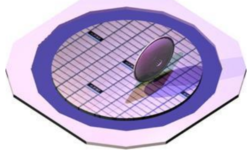
DAF Process

Back Grinding
for wafer thinning, thickness control





Dicing & Die Attach
for chip size sawing & Die attach with DAF at once



Use Die Attach Film

Final product

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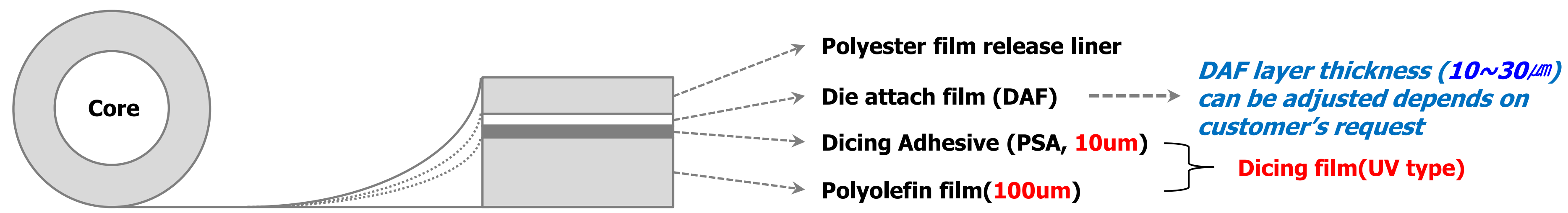
※ Die attach paste can flow to the outside of die and contaminate packages.

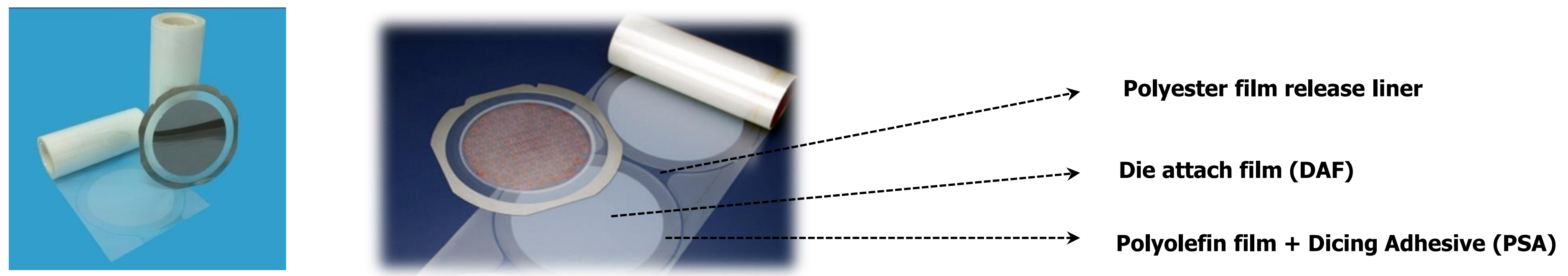
DAF Structure & Shape

DAF is consist of 4 layers including die attach film(DAF) layer.
And DAF layer has circle shape to fit for ring frame and wafer attachment.

DAF Structure



DAF Shape



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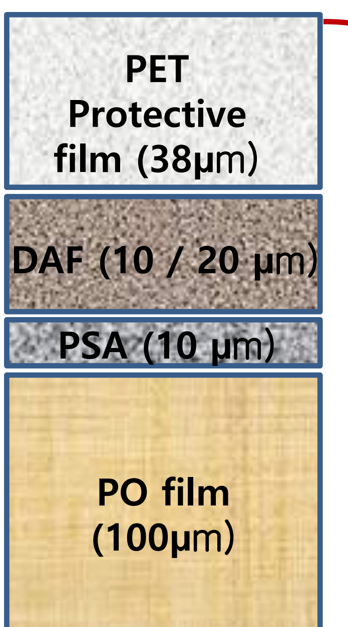
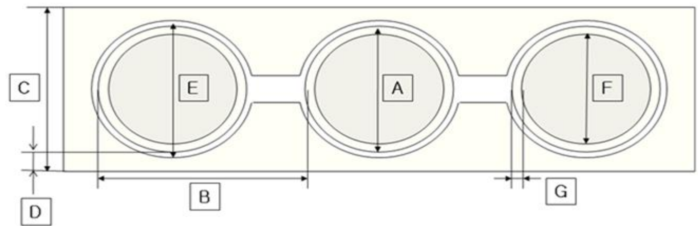
DAF Specification

AMC guarantees below specification and actual test result shows stable performance.

Especially AMC can control DAF layer thickness uniformity.



Characteristic		Spec	Unit	Comment
Roll width Size		390±2	mm	For 12 inch wafer
		290±2	mm	For 8 inch wafer
Sheets / roll		200	sheet	Can be decided according to customer's request
Thickness of Dicing Film		110±7	㎛	Polyolefin Film(100um) + Dicing Layer (10um)
Thickness of DAF layer		10±2	㎛	DAF layer only **Actual manufacturing under ±1㎛ range**
Thickness of Dicing Die Attach Film		120±10	㎛	DAF layer + Dicing layer + Polyolefin Film
Dicing Film/DAF Peel Strength	before UV	110±50	gf/25mm	Peel strength between Dicing & DAF layer
	after UV	≤ 20	gf/25mm	
Adhesion strength		≥500	N/m	-
Tg(after curing)		≥150	℃	-
Dicing film elongation		MD : 600±200 TD : 900±200	%	-



(Unit: ㎛)

	A	B	C	D	E	F	G
8 inch	270±1	279.5±1.5	290±2	10±2	277±1	220±1	25±5
12 inch	370±1	378.5±1.5	390±2	10±2	377±1	320±1	25±5

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DAF Properties

AMC checks and controls other properties even though not included in specification.

PET Protective film (38μm)

DAF (10 / 20 μm)

PSA (10 μm)

PO film (100μm)

Properties			Unit	Result
Modulus (DMA)	Non Cure	Room temp. ~200℃	Mpa	88.2(@150℃)
	After Full cure			8.44(@150℃) 6.35(@250℃)
Die Shear Strength	After Pre cure 30 min. @135℃	@180℃	Mpa	3.55
	Full Cure + After MRT (0, 12, 24h)	@R.T	Mpa	39.5 / 32.8 / 27.8
		@260℃	Mpa	11.7 / 12.4 / 11.6
CTE & Tg	α 1		ppm	213
	α 2		ppm	259.7
DSC Data	Before cure	On-set Temp	℃	189.3
		Delta H	J/g	38.79
	After Full cure	Tg	℃	239.3
Tensile properties	Adhesive layer	5% Modulus(MD)	MPa	4.67
		Elongation(MD)	%	268
	Dicing Tape	5% Modulus(MD)	MPa	6.8
		5% Modulus(TD)	MPa	5.5
		Elongation(MD)	%	684
		Elongation(TD)	%	754
180° Peel Strength	WBL Tape (DAF-Dicing)	Before UV	gf/25mm	113.4
		After UV cure	gf/25mm	12.9
	WBL-Wafer	Mount 60℃/70℃	N/25mm	0.76/1.14
Water Absorption	under 85℃/85%	after 24hr	wt%	0.86
VOC 1 hr @150℃			wt%	0.71
Ionic impurities	Cl		ppm	8.25

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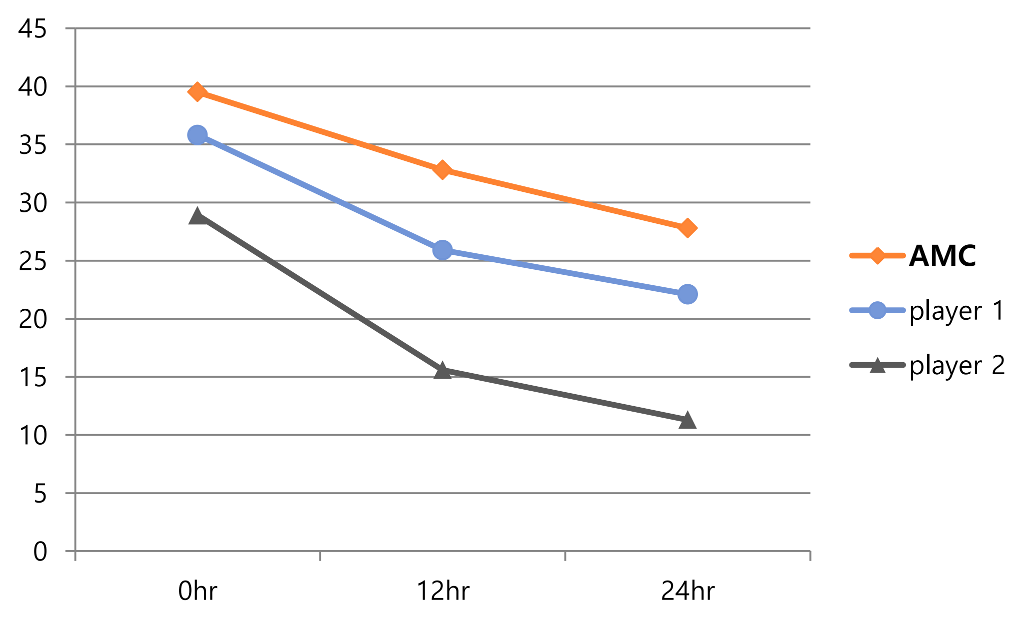
Compared with other DAF player's Die Shear Strength reliability in harsh condition(MRT(※)), AMC product shows the best performance.

10㎛ DAF layer Die Shear Strength comparison test

(※) MRT : Moisture Resistance Test (85℃, 85% moisture condition during 24hr)



(Unit: Mpa)

	ES-229D,N Series	Player 1	Player 2
0hr	39.5	35.8	28.9
12hr	32.8	25.9	15.6
24hr	27.8	22.1	11.3

(*) Player 1, 2 : Korean major domestic players

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DAF Product Line-up

AMC can offer proper product according to customers' process type and required DAF layer thickness.

DAF Product Line

Series	Product	Applicable Process
ES-229D Series	ES-229D-10 (~30)	DBG(Dicing Before Grinding) & SDBG(Stealth DBG) Process
ES-229N Series	ES-229N-10 (~30)	Normal & DBG Process

- **DAF layer thickness can be adjusted by customers' request.**
  - **10 / 15 / 20 / 25 / 30㎛ DAF layer**

- **According to customers' process type, AMC can suggest suitable product.**
  - **For normal blade dicing process**
  - **For DBG/SDBG sawing process**

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DBG Package Process Flow with ES-229 series

ES-229 Series is suitable for not only thin die but also DBG PKG Process(Ultra-thin Die PKG Process) requiring laser dicing process

UV CURING

< Wafer partial-cut Dicing> < BG Tape Lamination> < Back Grinding > < UV Curing >

Peel off

ES-229

Laser Dicer

Collect

Die

DAF

Needle pin

< ES-229 Mounting > < BG Tape Removal> < Laser Dicing> < Pick and Attach>

This process is as a kind of ultra-thin die fabrication process, it needs laser dicing process when DAF is diced during fabrication process.
In this case, ES-229 also shows excellent pick-up workability as well as laser dicing of thin die.

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Evaluation Results (1st Test)

√ Test Product Model

Dummy wafer

√ Test Parameter

Spindle RPM		Feed Speed	Blade Height	Dicing Blade	Cut Method
Z1	45,000	50 mm/s	155um	ZH05-SD3500-N1-CC	Step Cut
Z2	45,000	50 mm/s	70um	ZH05-SD3500-N1-BB	

√ Test Result

Sample	Wafer Thick.	Corner burr(%)	Side burr(%)	Bleed(%)
ES-229N-20	**60um**	**1.6**	**14.1**	**15.6**
Competitor A (Model A)	60um	**23.8**	**88.1**	**76.2**
Competitor A (Model B)	60um	**17.5**	**67.5**	**97.5**

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Evaluation Results (1st Test)

√ Test Image

	1	2	3	4	5
ES-229N-20					
Competitor A (Model A)					
Competitor A (Model B)					

Test condition : After UV

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Evaluation Results (2nd Test)

√ Test Product Model

Dummy wafer

√ Test Parameter

Spindle RPM		Feed Speed	Blade Height	Dicing Blade	Cut Method
Z1	45,000	50 mm/s	155um	ZH05-SD3500-N1-CC	Step Cut
Z2	45,000	50 mm/s	70um	ZH05-SD3500-N1-BB	

√ Test Result

Sample	Wafer Thick.	Corner burr(%)	Side burr(%)	Bleed(%)
ES-229N-20	**90um**	**0.0**	**5.1**	**1.7**
Competitor A (Model A)	90um	**0.0**	**25.8**	**10.3**
Competitor A (Model B)	90um	**22.4**	**31.0**	**36.2**
Competitor B	90um	**3.4**	**29.3**	**18.9**

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Evaluation Results (2nd Test)

√ Test Image

Test condition : After UV

	1	2	3	4	5
ES-229N-20					
Competitor A (Model A)					
Competitor A (Model B)					
Competitor B					

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Evaluation Results (3rd Test)

√ Test Product Model

Patten wafer

√ Test Parameter

Spindle RPM		Feed Speed	Blade Height	Dicing Blade	Cut Method
Z1	45,000	80 mm/s	155um	ZH05-SD3500-N1-CC	Step Cut
Z2	45,000	80 mm/s	70um	ZH05-SD3500-N1-BB	

√ Test Result

Sample	Wafer Thick.	Corner burr(%)	Side burr(%)	Bleed(%)
ES-229N-20	**50um**	**0.0**	**2.7**	**2.7**
Competitor A (Model A)	50um	**0.0**	**42.4**	**36.3**

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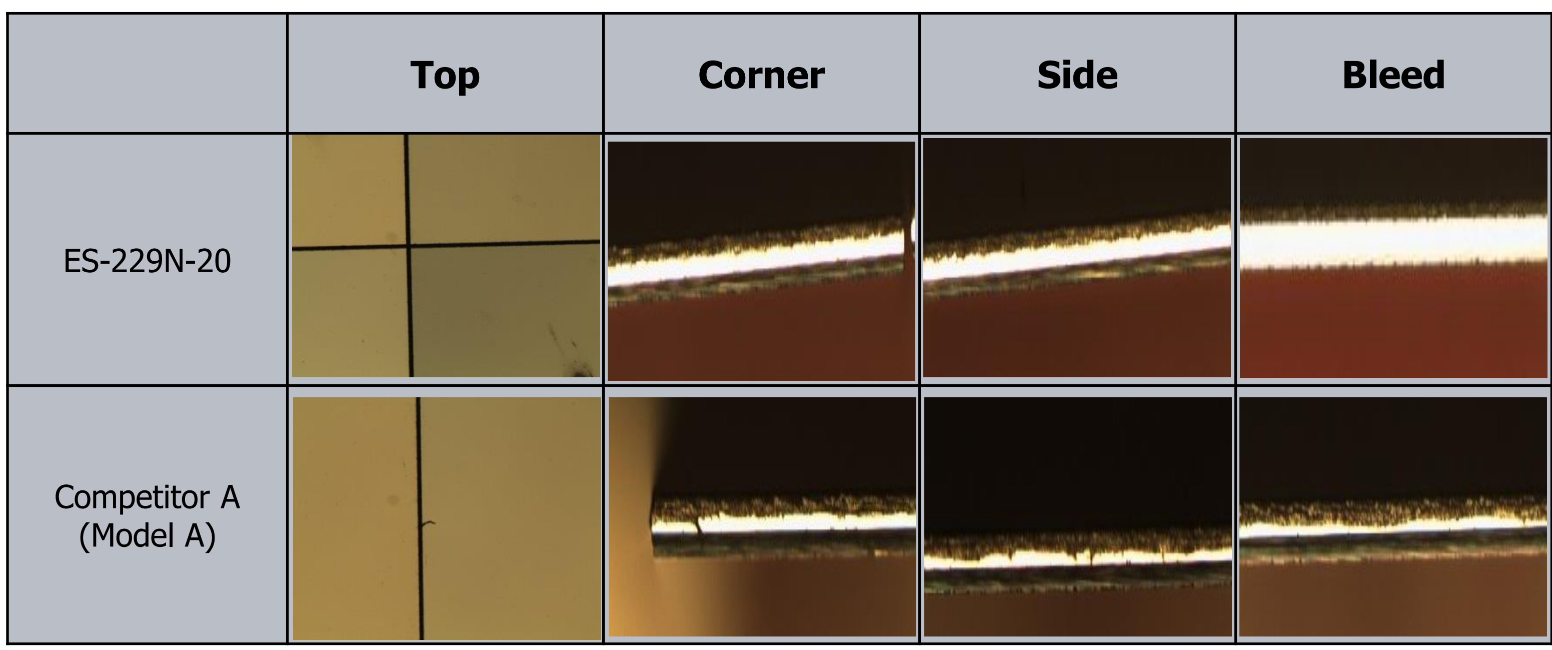
Evaluation Results (3rd Test)

√ **Test Image**



	Top	Corner	Side	Bleed
ES-229N-20				
Competitor A (Model A)				

Test condition : After UV

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√ Back grind / wafer sawing Process Quality Control Data

Item	S/S	Spec	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Avg.	Result
Kerf Width	Z1 : 8Line	Max 60um	32	35	32	36	34	35	37	32	32	33	32.0	37.0	33.8	Accept
	Z2 : 8Line		30	32	31	32	31	33	31	35	36	35	30.0	36.0	32.6	Accept

Top	Bottom	Side
Chipping Size : Max 3um	Chipping Size : Max 10um	Chipping Size : Max 5um

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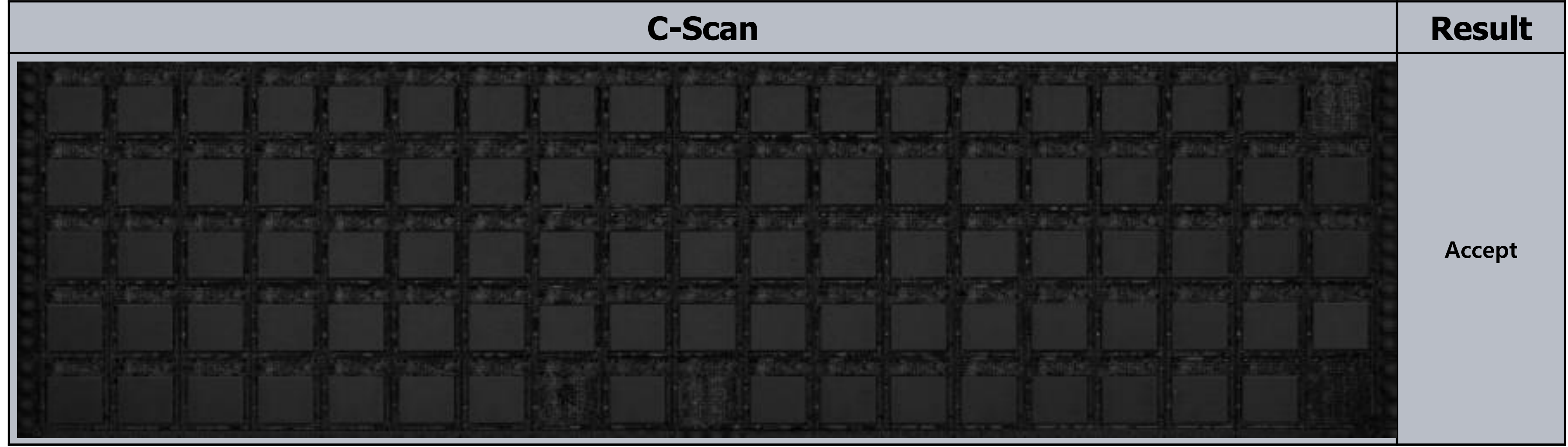
Workability Test Results

√ Back grind / wafer sawing Process Quality Control Data

Item	Die	S/S	Spec.	1	2	3	4	5	6	7	8	9	10	Min.	Max.	Avg.	Result
Die Position	1st Die	X : 10Unit	± 50um	13	16	18	10	16	11	10	15	13	13	10	18	14	Accept
		Y : 10Unit		8	13	10	13	11	11	13	14	13	12	8	14	12	Accept
	2nd Die	X : 10Unit		11	8	8	10	6	11	10	11	11	13	6	13	10	Accept
		Y : 10Unit		13	11	12	10	11	14	15	17	13	11	10	17	13	Accept

√ Chip to Chip Void

C-Scan	Result
	Accept

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√ **Pre-con Test**

Condition	Before Pre-con	After Pre-con	Result
85/85 96hrs			Accept
			Accept

T/C	-55~125°C, 5cycle
Bake	125°C 24Hrs
T/H	85°C/85% 96Hrs
Reflow	Peak 260°C, 3 cycle

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Thank You!