

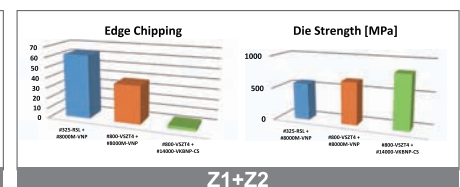
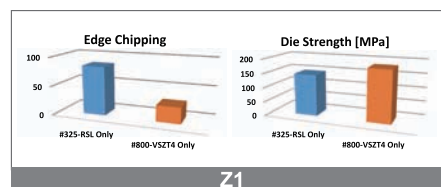
## VITRIFIED BACK GRINDING WHEEL (NANO POL)



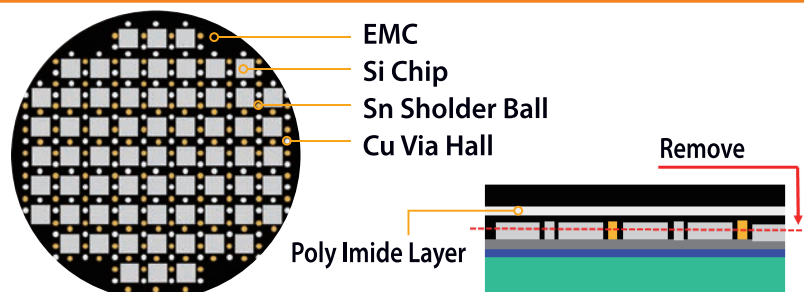
### Technology

- Wafer surface roughness and die strength can be improved
- Grinding stress and wafer edge chipping can be reduced
- Diamond at the tip can be distributed consistently
- Porosity, pore shape and pore size control can be adjusted
- Possible to grind Si wafer up to 17 $\mu$ m (Ultra thin wafer)
- Outstanding grinding ability for TSV and normal(for finger print) compound wafer

### Si Wafer Grinding Wheel



### Compound Material (Finger Print Strip) & Compound Molded Wafer (TSV/Fan-Out) Grinding Wheel



EHWA DIAMOND IND. CO. LTD.

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax : (82-31)374-9235

SALES DEPT. : Tel : (82-31)370-0500  
Fax : (82-31)370-0605

INTERNET : <http://www.ehwadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

| Material                                                     | Wheel Spec.                                                  |
|--------------------------------------------------------------|--------------------------------------------------------------|
| Pure Compound(Ex. EMC)                                       | #800 ~ #2000 VSP3,<br>#800 ~ #2000 VSP5                      |
| Compound + Silicon Chip                                      | Z1 #800 VSP3 + Z2 #5000VK8HS,<br>Z1 #800 VSP3 + Z2 #5000VK8B |
| Compound + Silicon Chip +<br>Copper Via                      | Z1 #800 VSP3 + Z2 #5000VK8HS,<br>Z1 #800 VSP3 + Z2 #5000VK8B |
| Compound + Silicon Chip +<br>Copper Via + Polyimide + Solder | Z1 #800 VSP3 + #3000 VSPS10,<br>Z1 #800 VSP3 + #3000 VSPBT7  |

# BACK GRINDING WHEEL



## Advantages

- 1) Rough grinding (Z1)
  1. Vitrified bond (#400~800)
    - ① Higher feed rate for better UPH.
    - ② Low and consistent grinding current and longer wheel life time
  2. Resin bond (#325~600)
    - ① Less edge chipping and grinding damage on thin wafer
    - ② Excellent grinding ability without compromising wheel life time
- 2) Fine grinding ( Z2 )
  1. Resin bond ( #2000 ~ #4000 )
    - ① Easy grinding with low and consistent grinding current
    - ② Considerably longer life time than competitor's
    - ③ #3000~#4000 : Superior surface roughness and minimized sawing mark

## Specifications

| Applications   |  | D                                  | W   | X   |  |
|----------------|--|------------------------------------|-----|-----|--|
| Rough grinding |  | Ø200 ~ Ø204<br>Ø250<br>Ø300 ~ Ø304 | 2~4 | 5~7 |  |
| Fine grinding  |  |                                    |     |     |  |

| Bond type |      | Machine, S/K type |   | Dimensions |          |
|-----------|------|-------------------|---|------------|----------|
| Resin     | BG01 | DISCO             | D | D          | Diameter |
|           |      | OKAMOTO           | O | W          | Width    |
| Vitrified | BG02 | TSK               | T | X          | Depth    |

| Mesh size | Bond name |
|-----------|-----------|
| #270      | VA        |
| #325      | VCL       |
| #400      | RB        |
| #600      | RS        |
| #800      | REC       |
| #1200     | RDC       |
| #1500     | SWB       |
| #2000     | SWA       |
| #3000     | SWC       |
| #4000     | SWD       |
|           | SWE       |

EHWA DIAMOND IND. CO., LTD

HEAD OFF.: 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
TEL: (82-31)370-9000  
FAX: (82-31)374-9235

SALES DEPT.: TEL: (82-31)370-9220  
FAX: (82-31)374-9079

HOMEPAGE: [www.ehwadia.co.kr](http://www.ehwadia.co.kr)  
E-MAIL: [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)



## EHWA DIAMOND IND. CO., LTD

**HEAD OFF.:** 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
TEL: (82-31)370-9000  
FAX: (82-31)374-9235

**SALES DEPT.:** TEL: (82-31)370-9220  
FAX: (82-31)374-9079

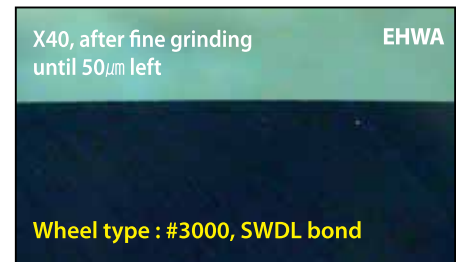
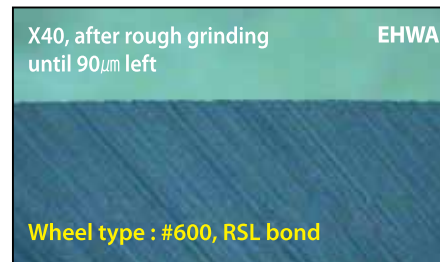
**HOMPAGE:** [www.ehwadia.co.kr](http://www.ehwadia.co.kr)  
**E-MAIL:** [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

## Performance Data

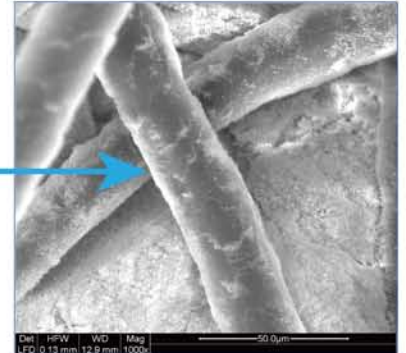
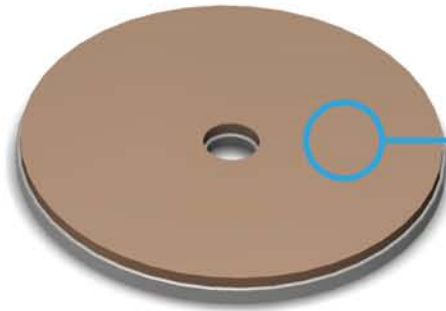
| Performance comparison : Z1                                |           | EHWA : RSL              |            | Competitor              |            |
|------------------------------------------------------------|-----------|-------------------------|------------|-------------------------|------------|
| Specification                                              | Bond type | Porous structured resin |            | Porous structured resin |            |
|                                                            | Mesh size | #400 ~ #600             |            | #320                    |            |
| Machine                                                    |           | DISCO 8760              | TSK PG300  | DISCO 8760              | TSK PG300  |
| Grinding ability<br>[Max grinding current, normal feed, A] |           | Around 12 ~ 13          | 9 ~ 10A    | Around 13 ~ 14          | 10 ~ 11A   |
| Life time<br>[Wafers / wheel]                              |           | Around : 18K            | Around 12K | Around : 13K            | Around 10K |
| Roughness [ Rmax, $\mu\text{m}$ ]                          |           | Around 3 ~ 4            |            | Around 4 ~ 5            |            |

| Performance comparison : Z2                                    |           | EHWA : SWD                             |            | Competitor              |            |
|----------------------------------------------------------------|-----------|----------------------------------------|------------|-------------------------|------------|
| Specification                                                  | Bond type | Wear resistant porous structured resin |            | Porous structured resin |            |
|                                                                | Mesh size | #2000 ~ #3000                          |            | #2000                   |            |
| Machine                                                        |           | DISCO 8760                             | TSK PG300  | DISCO 8760              | TSK PG300  |
| Grinding performance<br>[Max grinding current, normal feed, A] |           | Around 12 ~ 13A                        | 9 ~ 10A    | Around 13 ~ 14          | 10 ~ 11A   |
| Life time<br>[Wafers / wheel]                                  |           | Around : 18K                           | Around 12K | Around 12K~20K          | Around 12K |
| Roughness [ Ra, nm ]                                           |           | Around 7 ~ 8                           |            | Around 7 ~ 8            |            |

### · Wafer edge shape for ultra thin wafer



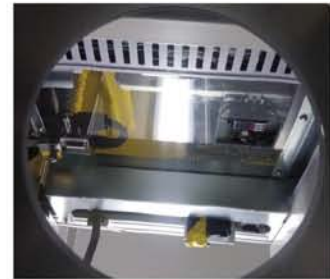
## DRY POLISHING WHEEL (DP)



**Wool Felt + ZrO<sub>2</sub> (250 nm)**

### Work Piece & Grinding

#### Silicon Wafer



- Z1 : EHWA BACK GRINDING WHEEL
- Z2 : EHWA BACK GRINDING WHEEL
- Z3 : EHWA DP-350D

### Roughness Result (EHWA)

#### WAFER ROUGHNESS TEST (Field test)

- Sampling Interval : 1.0um
- Objective : 20X
- Cutoff Filter : 80.00 (um)
- Machine : MP2000+

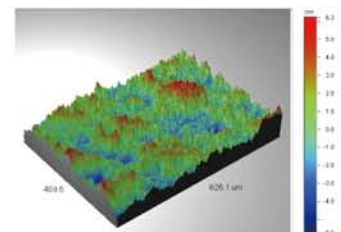
#### TOTAL ROUGHNESS AVERAGE

Ra Average = 1.64 Å



#### WAFER ROUGHNESS TEST (In house test)

- Ra : 1.17nm
- Rq : 1.48nm
- Rt : 11.97nm
- Machine : Wyko NT3300
- Method : Optical 3D Surface



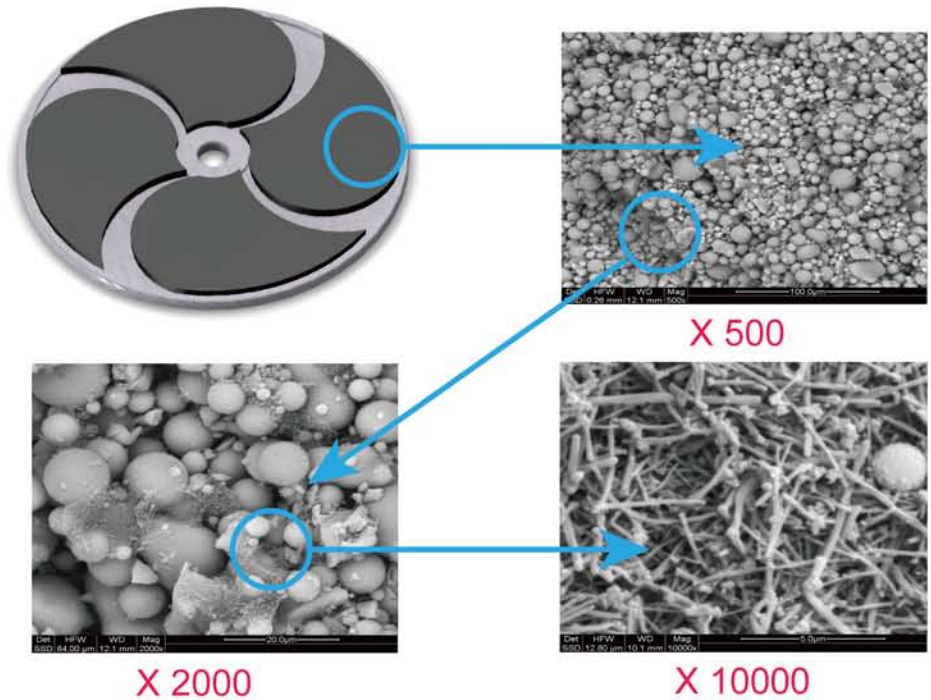
**EHWA DIAMOND IND. CO. LTD.**

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax: (82-31)374-9235

SALES DEPT. Tel : (82-31)370-0500  
Fax: (82-31)370-0605

INTERNET : <http://www.ehwadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

## GDP WHEEL



### Test Condition

#### EHWA GDP(Sample1) Wheel Test

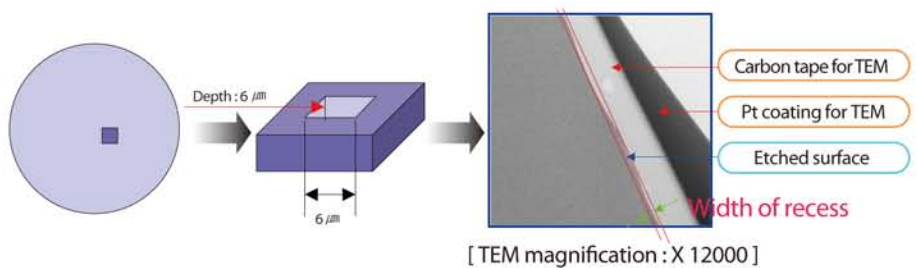
##### Processed Material

- Silicon Wafer Size : 12inch
- BG Tape Type : Lintec P-7180(180um)
- Machine Type : DGP 8761(NN2412) & DFM2800
- Quantity : Dummy Wafer x10 pcs

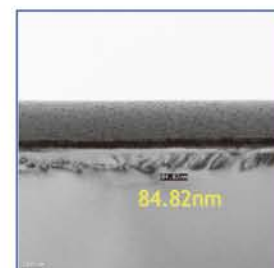
#### Wheel Type

- Z1 : EHWA BACK GRINDING WHEEL
- Z2 : EHWA BACK GRINDING WHEEL
- Z3 : EHWA-GDP 450D-26T-130H

### Roughness Result (EHWA)



#### Damage depth



Damage depth

EHWA DIAMOND IND. CO. LTD.

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax : (82-31)374-9235

SALES DEPT. Tel : (82-31)370-0500  
Fax : (82-31)370-0605

INTERNET : <http://www.ehwadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

## MICRO BLADE



### Advantages

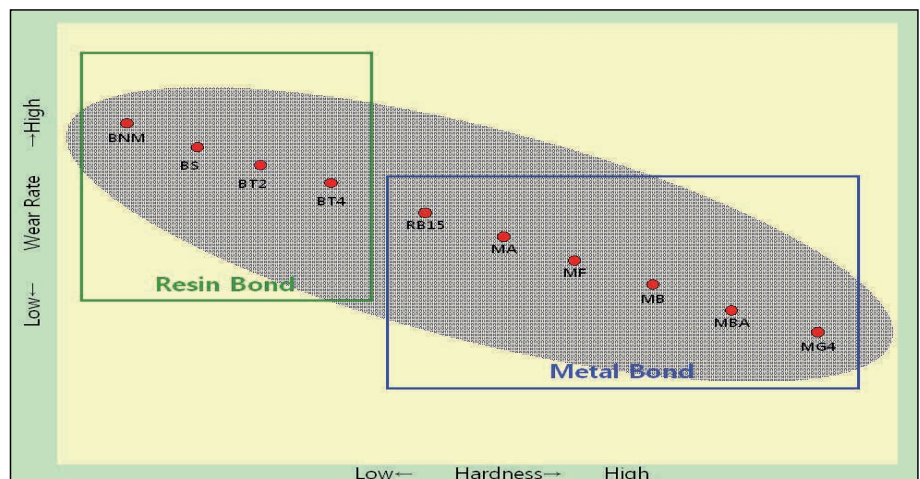
- High precision thin blade with superior cutting efficiency
- Maintains free cutting action at high RPM and fast feed rates
- Eliminate chipping during the sawing operation

### Applications

- Sawing of packages such as QFN, FBGA, CSP, MCP, POP, PBGA
- Sawing and grooving of Ferrite, Ceramics, Glass, Quartz, Sapphire

### Available Product Spec and Bond Series

| Out Diameter        | Minimum Thickness(mm) |            |                    |
|---------------------|-----------------------|------------|--------------------|
|                     | Metal Bond            | Resin Bond | Electroformed Bond |
| 52~60 mm (2.5 inch) | 0.10                  | 0.10       | 0.08               |
| 75~78 (3inch)       | 0.15                  | 0.15       |                    |
| 100~115 (4 inch)    | 0.15                  | 0.20       |                    |
| 120~130 (5 inch)    | 0.20                  | 0.25       |                    |



EHWA DIAMOND IND. CO. LTD.

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax: (82-31)374-9235

SALES DEPT. , Tel : (82-31)370-0500  
Fax: (82-31)370-0605

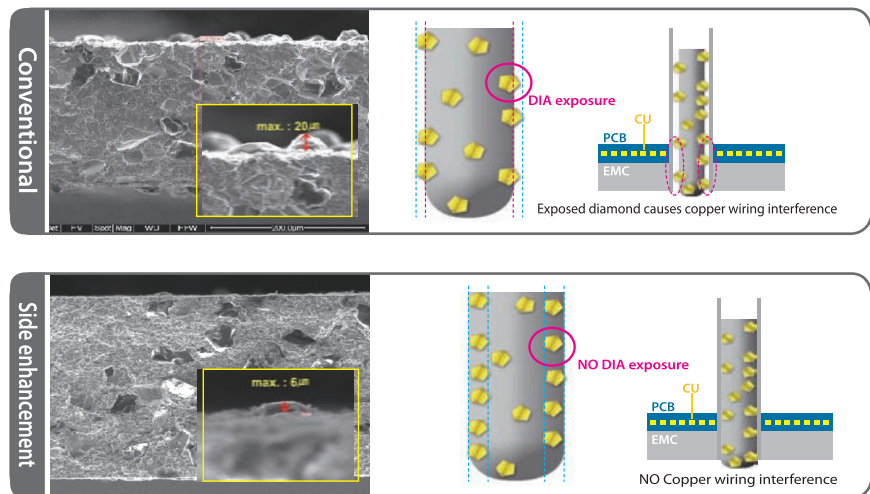
INTERNET : <http://www.ehwadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

## Elements of Blade Structure

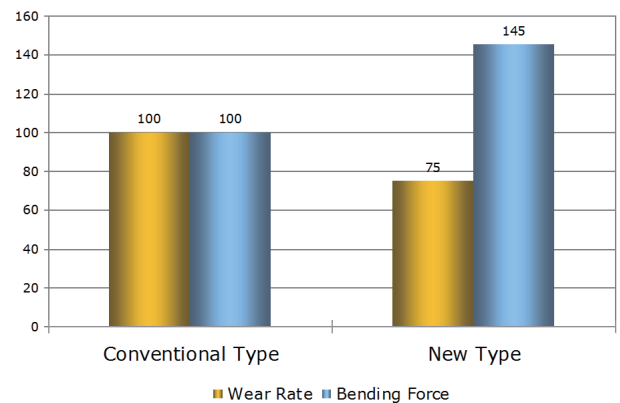
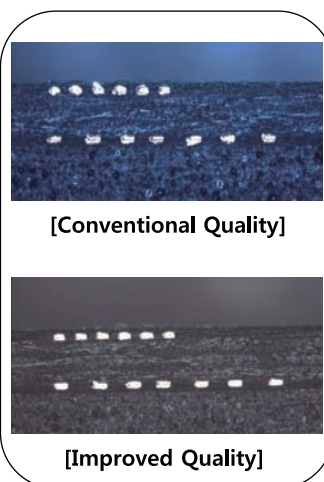
| BNM Series               | BS Series | BT Series | RB 15      | MB 15                    | MF | MA                                  | MB Series | MPQ2             | MBA   | MG4 |           |
|--------------------------|-----------|-----------|------------|--------------------------|----|-------------------------------------|-----------|------------------|-------|-----|-----------|
| Resin type               |           |           | Metal type |                          |    |                                     |           |                  |       |     |           |
| Hardness                 |           |           |            |                          |    |                                     |           |                  |       |     |           |
| Glass / Quartz / Ceramic |           |           |            |                          |    | LTCC                                |           | FBFA / CSP / LED |       | QFN |           |
|                          |           |           |            |                          |    |                                     |           |                  | CABGA |     | LED / MLF |
| Electroforming type      |           | Metal(Ni) |            | Hardness (Metal, Resin<) |    | Si, GaAs, amd PKG(Tape-CSP) cutting |           |                  |       |     |           |

## EHWA New Blade

- No diamond exposure of blade surface type
- Excellent cutting quality at Cu burr, Chipping and shape maintaining
- Superior blade life time and hardness than conventional blade



## Cutting surface of the PKG



EHWA DIAMOND IND. CO. LTD.

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax: (82-31)374-9235

SALES DEPT. , Tel : (82-31)370-0500  
Fax: (82-31)370-0605

INTERNET : <http://www.ehwadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)



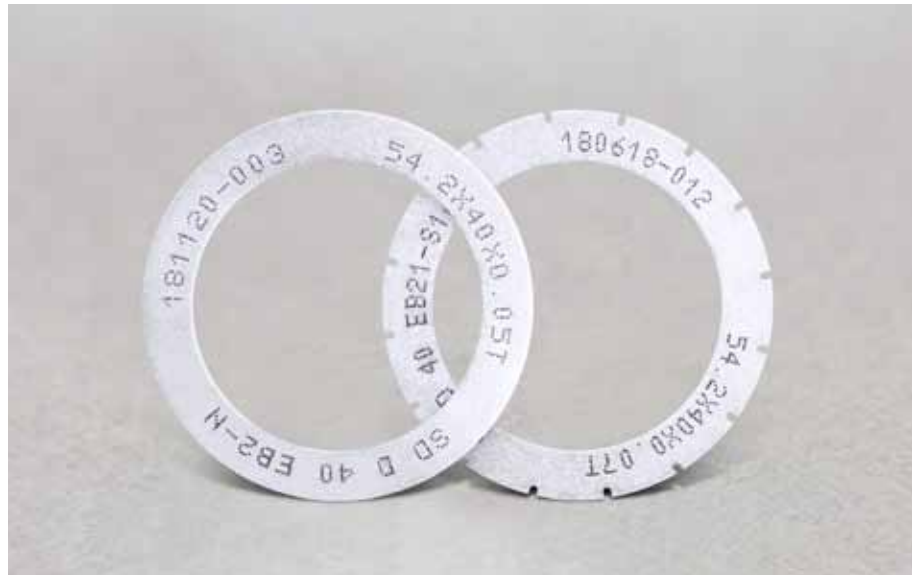
## EHWA DIAMOND IND. CO., LTD

HEAD OFF.: 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
TEL: (82-31)370-9000  
FAX: (82-31)374-9235

SALES DEPT.: TEL: (82-31)370-9220  
FAX: (82-31)374-9079

HOMPAGE: [www.ehwadia.co.kr](http://www.ehwadia.co.kr)  
E-MAIL: [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

## Electroformed Micro Blade

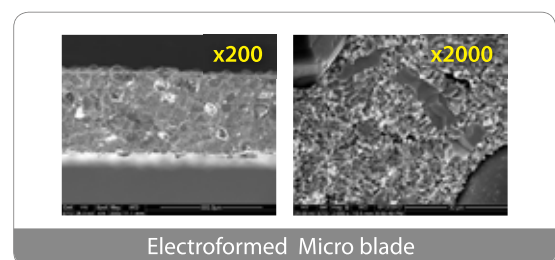
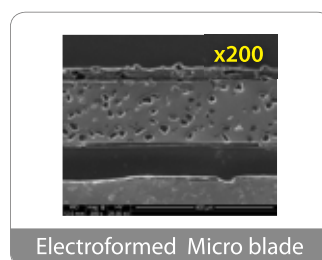


### Features

- High accuracy
- Ultra-thin hub-less blade (~50um) vs Metal bond micro blade (>100um)
- Cutting any hard materials (ex Ceramic package, LTCC, HTCC)
- Advantages of cutting PKG with high abrasive content
- High yield long life time

### Bonding Strength

- High bonding strength → long life time
- No pore in Ni bond microstructure



### Specification

- Thickness : >50um
- Outer diameter : >54mm
- Diamond concentration : 25~100con

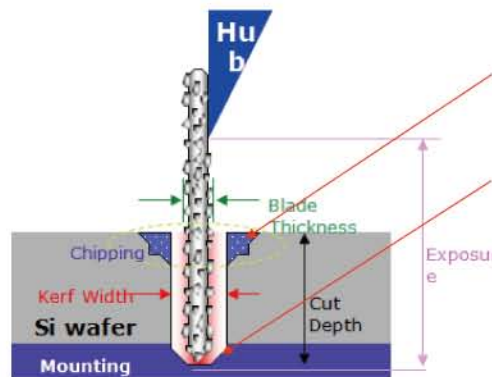
## DICING BLADE



### Advantages

- High accuracy, super thin blade developed by EHWA's cutting
- Minimized chipping and superior consistency in quality through stringent particle
- Size distribution control
- Improve productivity by high feed speed
- Providing an optimized solution to the customers

### Si Wafer Dicing Mechanism



Wafer Top Side : Wet Cutting with Coolant  
In general, fine diamond grit leads to small top side chipping.

Wafer Back Side : Dry Cutting without Coolant  
In general, coarse diamond grit minimizes back size chipping due to its cutting ability and less load imposed on each grit.

### Developing New Bond

#### Application

Si and Compound semiconductor

#### Features

Small top and backside chipping  
Improve productivity by high feed speed



Top chipping



Side & back chipping

EHWA DIAMOND IND. CO. LTD.

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax: (82-31)374-9235

SALES DEPT. : Tel : (82-31)370-0500  
Fax: (82-31)370-0605

INTERNET : <http://www.ehwadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)



## EHWA DIAMOND IND. CO., LTD

**HEAD OFF.:** 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
TEL: (82-31)370-9000  
FAX: (82-31)374-9235

**SALES DEPT.:** TEL: (82-31)370-9220  
FAX: (82-31)374-9079

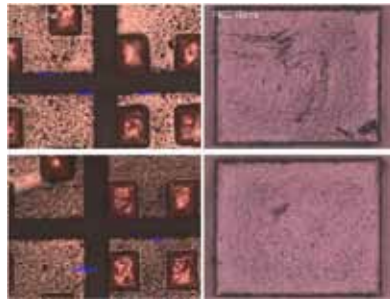
**HOMPAGE:** [www.ehwadia.co.kr](http://www.ehwadia.co.kr)  
**E-MAIL:** [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)

## Application

Application which requires thin kerf & long life time.

- Ceramic package (HTCC, LTCC)
- LED package
- PCB
- Etc.

## Ceramic Package Cutting



Chipping Size : 10~20 $\mu$ m (Max 27 $\mu$ m)

## METAL EDGE GRINDING WHEEL



### Advantages

- Various groove shapes can be designed.
- Grinded with uniform chamfer width (excellent rigidity)
- Strong groove shape retention.
- Product 1ea enables multi-stage grinding ( rough / fine grinding)

### Application

- LCD & OLED Panel, glass edge grinding

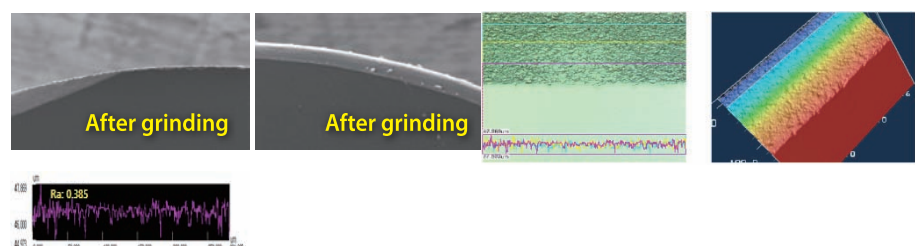


### Available Product Spec.

| Type     | Diameter   | Thickness | Grit Size    | Groove |
|----------|------------|-----------|--------------|--------|
| MD-DW    | Φ5 ~ Φ50   | 5 ~ 20mm  | #325 ~ #2000 | Metal  |
| MD-1FF6Y | Φ50 ~ Φ200 | 5 ~ 80mm  |              |        |

### Performance Data

| Applicaton         | Edge Strength | Life Time         | Chipping Size |
|--------------------|---------------|-------------------|---------------|
| 15" Panel grinding | 120~130 (Mpa) | 100 (cell/groove) | < 30μm        |



EHWA DIAMOND  
SEMICONDUCTOR / DISPLAY / SOLAR & LED



EHWA DIAMOND IND. CO. LTD.

HEAD OFF. : 374, Nambu-daero, Osan-si,  
Gyeonggi-do, 18145, Korea  
Tel : (82-31)370-9000  
Fax: (82-31)374-9235

SALES DEPT. , Tel : (82-31)370-0500  
Fax : (82-31)370-0605

INTERNET : <http://www.ewhadia.co.kr>  
E-MAIL : [semi@ehwadia.co.kr](mailto:semi@ehwadia.co.kr)