REPORT: Copper on mold compound dicing by Laser-MicroJet®

for Anonymous

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TASK

The Laser-MicroJet® technology has been tested for dicing 7 x 7 mm chips made of copper on mold compound.
For this new iteration a new laser source was used to improve the cutting quality by reducing the chipping of the mold compound.

A HLS machine that combines a saw blade and a short pulsed green laser was used for this process.

1. First step: cutting the mold compound from the backside with a saw blade
2. Second step: cutting the metal layer with the new laser source (short pulses with low average power)

Release of application report			
	Project Leader		Responsible Application Group
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Date:	25/10/2012	Date:	25/10/2012
Visum:	SDE	Visum:	BC

SAMPLE DESCRIPTION AND PREPARATION

SAMPLE	Layer	1	2	3	4	
	Material	Sn	Cu L/F	Ag	Mold	
	Thickness	6	200	6	650	*µm*
	Quantity				10	*pcs*

Samples (70 x 250 mm) from Anonymous Technology Korea

We divide the sample into halves, because the sample size is bigger than the vacuum chuck of HLS.

PROCESS: INSTRUMENT & TEST PARAMETERS

For these experiments, the HLS equipped with a short pulsed green laser has been used as the machine configuration in our lab.
It is a fully automatic cassette-to-cassette clean-room compatible machine, allowing to cut, drill, groove, scribe, trench, mark, or grind wafers of any kind of semiconductor material.

Major advantages of Laser-MicroJet® technology with regards to your application are:

- Cutting of arbitrary shapes
- Negligible heat damage to the material
- Parallel and smooth cut walls
- Limited slag/burr formation

In the table below, the optimized processing parameters used in the experiments are summarized:

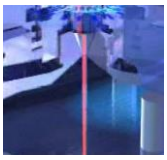
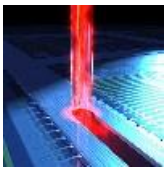
SYSTEM	Machine type	HLS

1. First step: cutting the mold compound from the backside with a saw blade

BLADE PARAMETER	Blade widht	340	*µm*
	Spindle speed	25,000	*rpm*
	Depth	650	*µm*
	Parts No (provided by Anonymous)	P08-SDC280-BR904-65	
CUTTING PARAMETER	Nber of passes	1	
	Cutting speed	25	*mm/s*
	Tape	Lintec Adwill®-633	
	Process time	2min24sec	*/half*

2. Second step: cutting the metal layer with a fiber laser

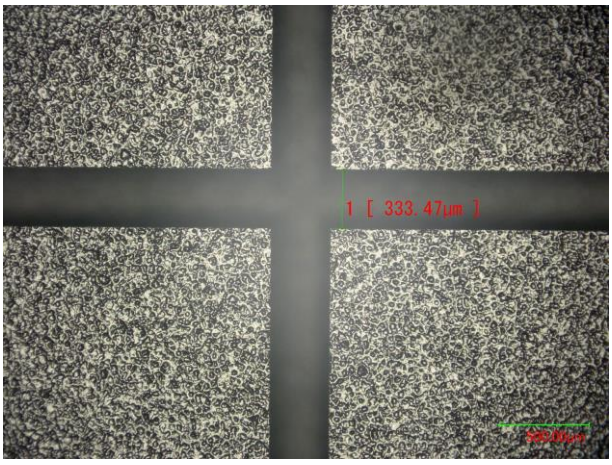
Various parameters were tried and the table below summarized the most relevant:

	**MICROJET® PARAMETER**	Nozzle diameter	60 *µm*
		MicroJet® diameter	~48 *µm*
		Water pressure	200 *bar*
		Assist gas	He
	**LASER PARAMETER**	Laser type	EO21G
		Wavelength	532 *nm*
		Pulse frequency	200 *kHz*
		Average power	~16 *W*
		Pulse width	~18 *ns*
	**CUTTING PARAMETER**	Scanning speed	100 *mm/s*
		Number of passes	~50
		Overall speed	~2 *mm/s*
		Fixing system	clamps

RESULTS

1. First step: cutting the mold compound from the backside with a saw blade

The following microscope pictures give an overview on the quality obtained with the saw blade at the end of the first step.

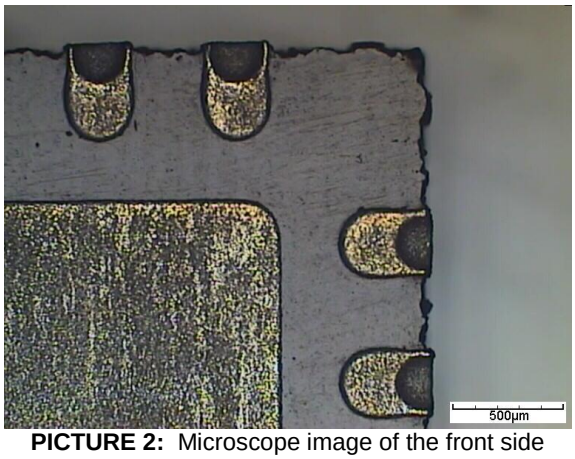


PICTURE 1: Microscope image of Mold compound
(blight field illumination; top view)

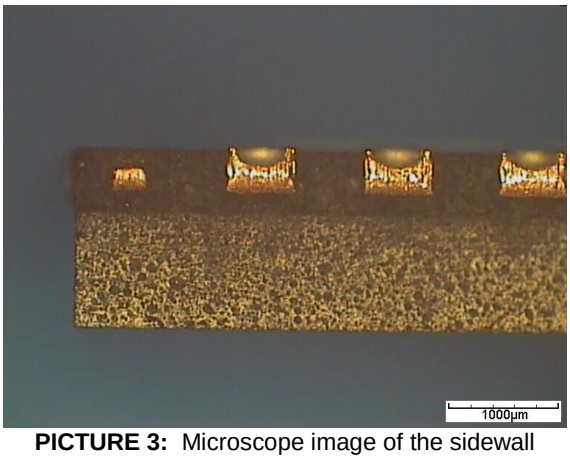
2. Second step: cutting the metal layer with a short pulsed laser

Laser cutting was done from the backside and the alignment was made at 40µm of the saw blade edges to minimize the withdrawal of the mold compound. Two lateral cuts were necessary for each street.

The following microscope pictures give an overview on the quality obtained with the fiber laser.



PICTURE 2: Microscope image of the front side (dark field illumination)



PICTURE 3: Microscope image of the sidewall (dark field illumination)

The chipping of the mold layer has been greatly improved. The average power available in our lab laser was limited. A better speed and further improved quality can be achieved with a more powerful short pulsed green laser.

CONCLUSION

The dicing of chips made of copper on mold compound was investigated on an HLS. This machine is based on the MicroJet® technology and combines the advantages of a pulsed laser with a saw blade.

For this third iteration the priority was to improve the cutting quality of the mold compound by reducing its withdrawal and to give the best idea of the quality that can be obtained with a short pulsed laser.

These tests show that:

- The new laser source allows the improvement of the cutting quality of the mold compound and less chipping is visible compared to the previous tests.
- Some small bridges may remain at the end of the process but this can be fixed by increasing the average power. (not possible with this laser source)
- Overall cutting speed with the available laser was ~2 mm/s, but can be improved with a more powerful laser.

We thank you for your interest in our technology and we hope our results meet your requirements.

Our sales agency will contact you soon to obtain a feedback about the analysis of these results and to discuss with you the further steps.